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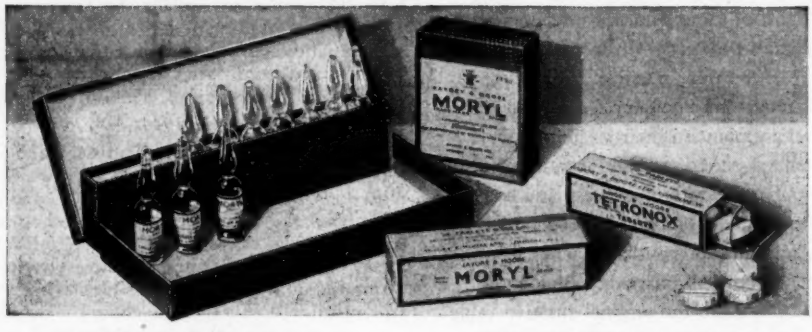

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References: Jour. of Mental Science, Jan. 1941; Jour. of Mental Science, Jan. 1942; Practitioner, Sept. 1942.

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LATE CLOSURE OF WOUNDS

PATRICK CLARKSON, M B LOND., F R C S
SURGICAL SPECIALIST, MAJOR RAMC
From an Army Special Surgical Unit

THIS paper describes methods by which wounds have been closed late by short-term operations. It is based on 78 wounds from the Tunisian, Sicilian and Italian campaigns treated in North Africa during a period of 6 months. The cases reached the base hospital, where the work was done, between the 6th day and the 6th month. No case was operated on before the 2nd week or after the 8th month.

The casualties do not represent a true cross-section of the wounds of these campaigns; most of them belong to one of two groups:—

1. Large soft-tissue defects of a manifestly long or indefinite natural period of healing, which were referred for free grafts or other forms of plastic closure.

2. Chronic wounds which had remained unhealed long past the period of healing expected for their original size, thus keeping patients in hospital or convalescent depot.

In the treatment of these casualties an attempt has been made to find out what are the limits of area for closure from local tissue, and to discover the operative means by which this local tissue can most safely be made to cover the wound.

TYPES OF OPERATION

The operations used in North Africa have all been short-term; that is, they have not required transport of tissue (other than free grafts) from a distance. They have been planned on the principles of repair from local tissue as taught by Gillies since the last war. These short-term methods have been adopted in North Africa, even in sites such as the lower half of the calf, where the prognosis for a good and durable healing, except by tube pedicle or cross-leg flap, has not been good. The wound in such cases has been healed by the short-term method, and then sent to the United Kingdom by trooper, for time and use to show the necessity or otherwise of long-term treatment.

1. *Approximation and secondary suture.*—The general value of secondary suture in early linear wounds is well recognised. What is not so widely appreciated is the number of late oval and rectangular wounds which are best closed by this method.

The closure, in oval defects, depends on wide undermining, and in taking advantage of the obliquity of the defect in relation to the limb. Many wounds which cannot be closed by approximation of their directly opposed points can easily be closed by pulling one side of the wound up and the other down. The skin edge is thus stretched along the line of its greatest amount of undermining; the suture line, moreover, can often be brought to lie across a lesser diameter of the limb.

Secondary suture after radical excision provides linear closure of the wound by a flap of skin and fat, and a supple scar which can stand up to pressure. In general the best results—and earliest sound healing—are seen when the wound is closed in one line, and the straighter that line the more uniformly satisfactory is the healing.

Of these 78 wounds which were largely referred as in need of extensive grafts or other plastic treatment, no less than 30 were found suitable for closure by secondary suture.

2. *Closure by rotation or swinging flaps.*—In this operation a flap of skin and fat is transferred on a hinge from a neighbouring site, where it is present in excess, to cover the defect. The secondary defect can generally be closed by approximation after undermining of the margins. If this approximation of the secondary defect causes tension across the flap it should be abandoned and the defect closed by a free graft. A free graft gives a better functional result, and is more certain of a 100% take on a secondary than on most primary defects.

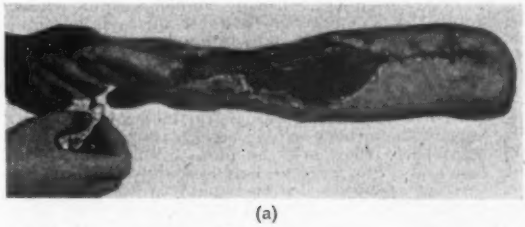
These rotation flaps are of particular value in wounds of the groin and upper thigh, where viable abdominal flaps can usually be planned to close easily defects of up to 120 sq. cm. In the elbow region the excess of olecranon skin can be swung forward to cover areas of 80 sq. cm., on the sides and front of the elbow. The skin of the upper part of the back of the calf over the gastrocnemii bellies will provide cover for more anterior defects of 80 sq. cm. Approximation will as a rule close the secondary defects.

On the abdomen and flanks, swing flaps of 10 by 9 cm., and rotation flaps of 9–12 cm. (base) by 8 by 2–4 cm. have been used. There is greater elasticity in the construction of these flaps (in the relation of length to breadth) in arms and shoulders than in the lower limb, and the widest liberty of all is of course enjoyed in the head and neck where apparently perilous flaps can be planned on a narrow pedicle over the known site of a vessel.

Of 78 wounds, 24 were treated by swinging and rotation flaps.

3. *Free grafts.*—Sheet and patch grafts of split skin have been used as the only means of closure in early wounds (2–6 weeks old) in sites not needing a cover of fat as well as skin. They have been used, too, for primary closure in cases which would need a later long-term repair; and for wounds which communicated with a joint, such as the knee, when a radical excision and local closure was unsafe. Defects of less than 200 sq. cm. have been covered by closely packed thin, 1 cm. square, patches of split skin graft, applied on greased paper.

Only 9 of the 78 cases were treated by free grafts alone.



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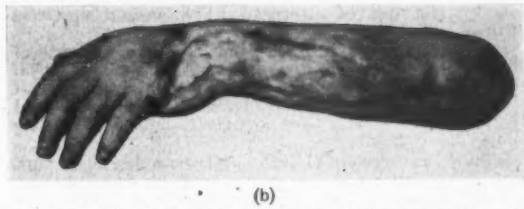


(b)

Fig. 1 (case 75)—(a) Forearm defect with compound fracture of carpus; 2 weeks old, 30 × 11 cm. Upper 100 sq. cm. closed by approximation. (b) Lower 200 sq. cm. covered by dermatome graft. Healing complete in 14 days.

4. *Combined operations.*—In some large defects the best functional result is obtained by a combination of all methods—approximation, flap, and free graft. By thus combining methods it is often possible to provide a cover of skin and fat for a part of the wound which needs it, leaving the remainder to be closed by free graft. Before choosing to cover a wound by free graft alone, it is worth considering whether some portion needs a fat and skin cover, and whether this cover cannot be provided from local tissue. Examples are:—

In case 75 (table 1st), with 300 sq. cm. defect along the ulna from elbow to carpus, a cover of full thickness was provided for the olecranon by approximation over the upper 100 sq. cm.; the remaining 200 sq. cm. was covered by a dermatome graft, and the healing was completed in 2 weeks (fig. 1).

In another case, with a 500 sq. cm. area on the popliteal fossa and calf, the upper part of the defect was covered by a rotation flap swung from the side of the knee, the middle of the wound and the secondary defect were covered by SS grafts, and the lower part closed by approximation. Healing was complete in 4 weeks.

Of these 78 wounds, 15 were treated by a combination of operations.

BASIC POINTS IN TECHNIQUE

There is nothing original in this technique, which is simply an attempt at application of the teachings of Gillies and Lane.

Excision.—The wound is treated as an ulcer and excised radically. This part of the operation is done with "no touch" technique and as far as possible contamination of the subsequent field by the "ulcer" is eliminated. Skin is excised back to "good surgical material"; that is, all the new skin, all friable œdematous edge skin, all old suture scars, and all parts of the skin margin are removed back to the point where one can obtain a good vertical edge in skin of quality which will hold a silk suture for 10–12 days. The granulations and fibrotic base are excised completely and removed in one piece with the skin edge. Where the granulations lie in the known site of a main vessel or nerve, or on a joint, they are curetted as much as is safe.

Undermining is carried out superficial to the deep fascia and is generally safe for 6–8 cm. The vessels to the skin of the leg emerge from the fascia along the line of the vertical intermuscular septa. A knowledge of this will often spare them. If fascia is taken with the skin the property of the skin to stretch is largely lost and a much larger flap has to be cut out for the defect.

Hæmostasis.—Bleeding is generally brisk. Clip hæmostasis has been used, and every attempt made to include a minimum of tissue with the bleeding point. All spurters have been under-run with 6/0 catgut. Venous bleeders have been controlled by torsion and hot packs. The control of hæmorrhage by these methods is time-consuming, and in thoroughness may not give complete satisfaction. Diathermy would perhaps be useful if available.

Closure.—009 and 004 suture silk, at 0·5–1 cm. intervals, has been used, taking skin bites of 0·5–1 cm. Stay sutures have been avoided except in the buttocks, and even there they may be more often a source of infection and necrosis than a help in maintaining apposition. Great attention has been paid to accurate edge apposition. This is obtained by properly cut non-bevelled skin edges, by sutures inserted at right angles to the skin in the technique described by Gillies, and by the use of alternate Lane end-on mattress sutures.

It is on the new skin bridge that the main strength of the wound will depend during the first 3 weeks. Local points in the suture line of inversion or separation of edges are points of mechanical weakness, which may lead to general cleavage. They are also points of entry for infection.

Wound antiseptics.—Local sulphonamides have not been used. Penicillin would have been valuable but was not available. During the operations the wounds have been liberally bathed in 1/2000 acriflavine. The operation cannot be rendered entirely clean, but by this local antisepsis, and total excision of the granulations, we tried to reduce to a minimum the size of the inoculum of bacteria which remains to infect the wound. Drains have not been used except in the presence of infected bone.

Fixation.—Plaster fixation by spicas with a window over the wound has been adopted in groin and shoulder regions. Elsewhere light compression by crêpe over wool, and 'Domette,' and wool over the whole limb distal to the wound, have been applied. In the ward the limb has been elevated.

Sutures.—The wound is examined, and fine sutures are removed on the 6th day. Other sutures are removed at from 8 to 14 days, early removal being dictated by infection. This infection of sutures is commonly late—after the 8th day. It can be controlled by a gentle and thorough dressing toilet, with removal of scabs from the orifices of the suture holes. Otherwise it may burrow extensively.

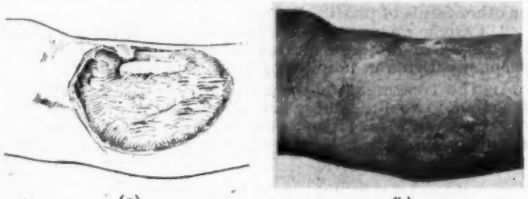
Movement.—The affected limb is immobilised for a fortnight and then for a further week allowed only gentle movements in bed. These widely undermined flaps heal slowly, and what may appear a soundly healed wound, without a trace of infection, can break open if used vigorously before 3 weeks. After 3 weeks active movements are instituted.

LIMITS OF LOCAL CLOSURE

Undermining is the essential step by which neighbouring tissue is made available to cover the defect. The extent to which a skin edge may be safely undermined is nowhere precisely laid down, and indeed precision is not possible. Considerable attention has been paid to this point.

Within limits of 1–2 cm., certain figures were found to be fairly constant for different parts of the body. Thus in the leg, below the level of the bellies of the calf muscles, 4 cm. is safe; another 1–2 cm. may be. The margin of safety increases higher in the limb, where 7–8 cm. is always safe, and 1–3 cm. more may be. In the abdomen and back the safe figure is 8–10 cm.; and in the arm, over and above the forearm bellies, 8–10 cm. can generally be undermined without edge necrosis.

From time to time attempts were made to exceed these limits, and to cut large flaps whose viability was uncertain, in order to obtain some quantitative idea of the limits of closure by local tissue. The following 4 cases describe such experimental closures:—



(a) (b)

Fig. 2 (case 2)—(a) Drawing of upper shin defect 10 × 11 cm. 2 weeks old with sequestrating tibia. (b) Defect closed by rotating flap from back of calf. Healed in 21 days.

1. *Arm.*—Defect 120 sq. cm. on outer side of elbow, 14 weeks old and twice previously treated by pinch grafts. After radical excision two rotation flaps, one hinged above and posteriorly and one below and posteriorly, were swung over the defect. Secondary defects closed by approximation. Healing complete in 2 weeks, with full range of elbow movement.

2. *Front of calf.*—Two-weeks-old mine wound, defect 110 sq. cm. over infected chip-fracture of tibia. Chip of infected bone 6 by 3 cm. removed and wound closed by flap rotated from back of calf. Secondary defect closed by approximation. Healing complete in 3 weeks (fig. 2).

3. *Back of thigh.*—Defect 176 sq. cm. (500 sq. cm. after excision), undermining to 8 cm. medially and 12–14 cm. laterally. Flap advanced from above and rest of wound closed by approximation. Some patches of necrosis along lateral border of wound; excised 10th day and covered with thin SS graft. Healing of whole complete in 21 days (fig. 3).

4. *Loin and upper buttock.*—Defect 252 sq. cm. with 6 by 8 cm. of exposed infected ileum. Previously failed SS graft. Ten days after extensive sequestrectomy, defect excised—area then 28–30 cm.—and closed by rotating a large abdominal flap backwards and advancing the buttock up and the middle of the back outwards to meet it. Some edge infection but healing substantially complete in 30 days.

These cases illustrate large defects closed by rotation or swinging flaps without the use of free grafts to primary or secondary defects. The approximate limit of area which can be closed by direct approximation is shown in case 5, a buttock defect of 9 by 12 cm. (16 by 11 cm. after excision of wound) and in case 9 (table I A), anterior mid-thigh defect of 10 by 7 cm. (15 by 11 cm. after excision of wound). Both these wounds were closed by approximation and secondary suture, after 8–10 cm. of undermining, and healed in 12 days.

PATHOLOGY

The factors to be discussed here are those which retard the natural process of repair, and those which may prejudice the success of closure by operation.

Marginal ingrowth and central fibrosis.—The normal rate of marginal ingrowth of epithelium over a wound varies widely in different parts of the body. Other

things being equal, it is most rapid in the head and neck, where it may be 1 mm. a day; it is more rapid in the upper limb than the lower, and in the upper parts of the leg than in the calf and foot. The marginal ingrowth was measured in the 78 wounds reported here. Regardless of site, rates of more than 1 mm. a week were not observed; and in wounds more than 8 weeks old a total of more than 6–8 mm. of new skin edge was seldom seen. This arrest of marginal ingrowth to 6–8 mm. is ascribed to the progressive fibrosis and avascularity of the granulations in the central part of the wound.

In excising wounds up to 4 weeks old, it is seldom possible to define a plane of demarcation between the base of the wound and normal tissue; but by the 8th week the white fibrous base of the wound is easily distinguishable from the surrounding muscles, into which it ramifies along the track of the missile. On section after this date, the edges supporting the 6–8 mm. of marginal ingrowth may show vessels, but more centrally vessels are absent and only fibrous tissue infiltrated with inflammatory cells is seen. These central granulations are often as unreceptive to a free graft as they are to the ingrowing skin edge, and epithelium which survives on them is poorly nourished and commonly unstable.

Contraction of this central fibrosis plays an important part in determining the size of the final scar. At the completion of natural healing the area of new epithelium may be only 30–70% of the area of the wound when a fortnight old. Centripetal pull of the central fibrosis on the surrounding skin has provided the rest of the cover. The deeper the wound the greater is the proportion of skin cover provided by pull on the surrounding intact skin.

Bacterial infection.—Any wound yielding much daily pus has been considered unsuitable for immediate closure, whatever the organism grown. Profuse discharge is commonly due to dead tissue (bony or soft), an inadequately drained cavity, or infected foreign material (seldom metallic). The underlying cause has been given preliminary treatment combined with ablation of the granulations. For dead bone a sequestrectomy has been done at the time of excision of the wound and drainage provided for the closure.

The incidence of hæmolytic streptococcal infection of wounds and burns has varied. In one batch of mixed burns and wounds reaching the base in the first 3 months of the Tunisian campaign it was 70%. Of equal variability has been the local virulence of the strains. Free grafts have often been successfully placed on granulations infected with hæmolytic streptococci, but in a significant proportion of cases the presence of such streptococci has caused total loss of the graft. Neither type nor group of streptococcus, nor appearance of granulations, is a reliable guide to the local toxicity of the infecting streptococcus to free grafts and devitalised flaps.

In this series of 78 wounds the incidence of complications—localised cellulitis and stitch abscess—has been notably higher in the cases with preoperative hæmolytic streptococcal infection than in those infected with other organisms. Infection of wounds with morphological Klebs-Loeffler bacillus has been common. In one group of 30 casualties from Italy 6 days to 6 weeks old, 20 showed morphological KLB in their wounds. The great majority of these morphological KLB infections are not significant; but in countries where diphtheria is endemic some evidence of systemic virulence might be expected, and it has been seen in 2 cases, each of which showed a peripheral neuritis. In neither was there anything characteristic in the appearance of the wounds, which were superficial limb wounds 6–12 weeks old, with dirty granulations showing fairly profuse thick acrid pus.

There has been evidence of local toxicity, too, in these morphological KLB infections. Thus 4 cases of free grafts to burnt areas, which had originally been 80% take, showed between the 10th and 30th day a progressive breakdown of the graft. During this time KLB alone was grown from the granulations. Fresh grafts, after 40,000 units of antidiphtheritic serum, took and were stable. A further point suggestive of a local toxic effect of these organisms on fresh epithelium has been the high incidence of KLB in chronic wounds.

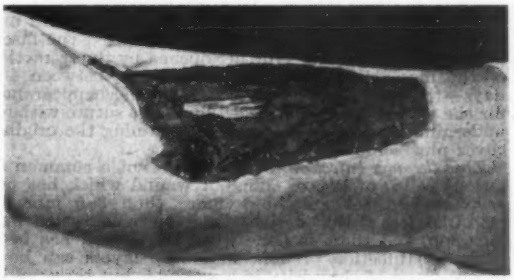
Local applications.—Local proflavine powder was given a short trial in Sicily. This highly acid powder (pH 1·5) caused intense tissue necrosis. One of the chronic thigh wounds of this series had been so treated; 6 months later this wound was still open, though the other wound of the same patient treated by local sulphonamide had long since healed. This is the only case in this series of 78 wounds in which there is definite evidence of a local antiseptic being harmful and delaying healing.

TISSUE LOSS IN LATE WOUNDS

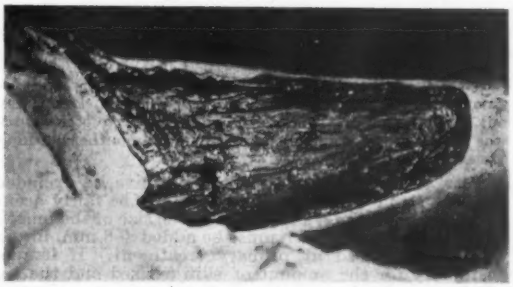
The true tissue loss by the 2nd week after wounding may be due to any one, or any combination, of three factors—missile destruction, surgery, and infection.

Destruction by missile.—A variety of factors, of which type, range and size of missile are the chief, influences the amount of tissue destruction at the time of wounding. In this series the Tunisian casualties were predominantly mortar wounds: the Sicilian casualties showed the highest proportion of wounds due to small arms; while the Italian casualties of the series have been most commonly caused by shell fire.

The skin loss caused by sharp high-velocity fragments is small. It seldom exceeds the diameter in which the missile entered, plus 1–3 mm. of edge destruction caused by heat and by the lateral compression wave of the missile. This assessment is based on observation of untreated wounds



(a)



(b)

(c)

Fig. 3 (case 3)—(a) Defect 10 weeks old, 16 × 11 cm. on back of thigh. (b) Defect excised radically and edges undermined. Size now 34 × 25 cm. (c) Defect closed by approximation below and advancing flap from above. Healing complete in 21 days.

which have escaped infection, plus the fact that though excision of the skin margin is seldom more than 2–4 mm., necrosis is not often seen in the margins of wounds so treated. Loss of fat and deep fascia corresponds to loss of skin, but muscle loss is always more extensive, largely because its friability and vascularity render it prone to damage from contusion and thrombosis.

In the assessment of soft tissue loss due to missile destruction, disruptive wounds have to be considered separately. Here traumatic flaps are formed by the missile. To the loss from contusion of the edge of these wounds is added a further loss from ischæmia of the non-viable parts of what are commonly long narrow flaps.

Loss due to excision.—Surgical practice varies from army to army, and from campaign to campaign. The variations accord with what experience has shown to be the needs of the particular campaign, or sometimes only with fashion. Radical excisions proved unnecessary in the desert, where conservative early treatment caused little early risk, saved man-power and shortened hospitalisation. The Tunisian wounds demanded a more radical attack, and experience in Italy has conformed to Tunisian standards in indicating the need for routine thorough excision.

At no time since France, however, have wide early skin excisions been common. In both British and US Armies now 2–4 mm. is the practice. More attention is of course paid to muscle and to liberal incision of the ensheathing deep fasciæ. This opening of the deep fascia is the critical factor in determining the later size and appearance of the wound: on being incised the fascia gapes, and the wound is further opened by the retraction of the more elastic skin. After a time—between 4–7 days—the loss is established in fact as well as appearance, for the wound cannot be closed by direct suture without undermining or other methods of regaining the original cover plus some excess.

Loss through infection.—Infection is not a common or serious cause of loss of skin. A wound which has not been excised seldom shows more than 3–5 mm. of marginal loss; this derives from both contusion and infection, and there is none when the wound has been excised. Infection of bone and deep layers can be a potent cause of chronicity in a wound; but these infections, however grave constitutionally, are not often a ource of further loss of the old skin.

Two cases, however, have been seen which have shown a superficial progressive infective skin loss. One was comparable to that sometimes seen around the wounds of empyemata and appendix abscesses. In this case, a hæmolytic-streptococcal infection, was responsible for skin loss amounting to 1000 sq. cm. before the infection burnt itself out. In the other, from which only *Staphylococcus aureus* was grown, the loss was recurrent over 10 months, but never exceeded 20–30 sq. cm.

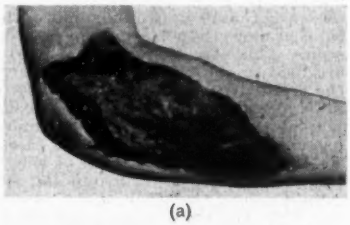
Total tissue loss.—If disruptive wounds be excluded, the true tissue loss of most wounds can be fairly accurately assessed from a knowledge of the size of the missile, to the diameter of which must be added 4–8 mm. for the total skin excised at primary treatment. If it were customary for the amount of skin excised and the size of the wound at operation to be recorded on the field medical card, along with the size of the missile, much more accurate assessments could be made.

Most wounds of 40–50 sq. cm. can be closed by direct approximation after undermining. Assessment of the tissue loss from a knowledge of size of the missile, and of the amount of skin excised, will show that in the great majority of wounds in this war the true skin loss is less than 40–50 sq. cm. and that these wounds can be closed by approximation of local tissue.

OTHER METHODS OF LATE TREATMENT

For the greater part of the war, and at the period when this work was done, radical operation such as described here has not been the usual or routine late treatment of soft-tissue wounds. Conservative secondary suture, occlusion in plaster, and pinch grafts have been customary treatments and deserve comment.

Conservative secondary suture.—In this operation the edges of the wound, after minimal paring and undermining, are roughly approximated by heavy sutures, taking deep bites. The central granulations are left; they form a poor bed for the epithelium, which must still grow slowly across them, and they are a potent cause of infective postoperative complications. The method yields an abundant crop of bad results, and is based only



(a)

(b)

Fig. 4 (case 26, table IA) — (a) Forearm defect 18 × 7 cm.; 2 weeks old. (b) Defect closed by approximation and advancing flap downwards from above. Healing in 10 days.

on an unnecessary respect for the bleeding which accompanies total excision, and a fear of damaging vital structures while doing a complete excision.

Occlusion in plaster.—A plaster cast is valuable during evacuation, and for immobilising large soft-tissue defects in the early stages. But a plaster encourages a policy of delay, and decisive treatment may be put off until long after the time at which the wound should have been closed and healed. Furthermore, a constant bath of pus is a bad thing for new epithelium, and may indefinitely retard its growth. A high proportion of the chronic wounds of this series had spent long periods in occlusive plasters.

Pinch grafts.—The technical ease with which these grafts can be applied, and their wide reputation as a good means of covering extensive granulations, has given them a popularity quite beyond their scope and merits. The prevalence of hæmolytic-streptococcal and KLB infections made the expectation for "takes" of pinch grafts in North Africa about 50–60%; and healing of the remaining area and the final scar were commonly far short of what was desired. In extensive raw areas—over 200 sq. cm.—pinch grafts are definitely inferior to thin split skin patch grafts, which are more likely to take in the presence of hæmolytic-streptococcal infections, heal more rapidly and leave a less disfiguring scar in the donor site.

RESULTS AND COMPLICATIONS

Of 30 defects closed by approximation, 27 were soundly healed in 10–21 days. The wounds include 7 which were 7 by 10 cm. or over (table IA).

Of 9 defects closed by swinging flaps, 5 were healed in 10–21 days, and the other 4 by 21–42 days; 6 of these defects were 7 by 10 cm. or more. The high incidence of complications in this group (6 out of 9 cases) was chiefly due to unwise attempts to close the secondary defect by approximation, thus causing tension on the flap (table IB).

Of 15 rotation-flap closures, 12 were healed in 10–21 days. This group of cases included some very large defects (15 by 10 cm. and 18 by 14 cm.); it also included 4 very small wounds in the head and neck (table IC).

The 9 wounds closed by free grafts alone all gave satisfactory immediate results; all showed 80% or more take, and 6 of the 9 were healed in 10–21 days. There were 2 unsatisfactory late results, both due to KLB infection of the graft (table II).

Combined operations were used for the largest defects; 9 of the 15 wounds were of the order of 7 by 10 cm. or more, including 5 of 10 by 15 cm. or more. Of the 15, 8 were healed in 10–21 days, and 5 more in 28 days. The

remaining 2 were healed between the 6th and 8th week (table III).

The *complications* in this series were from two related causes, infective and vascular.

Infective complications.—There have been no major complications, such as major abscesses or systemic infections, following these closures of wounds between the 2nd and the 33rd week. Edge redness and minor stitch abscesses were fairly common; they appeared late from the 6th to the 10th day—and pus was inclined to burrow.

Hæmolytic-streptococcal infections apart, the type of organism did not seem to bear any direct relation to the incidence of infections. Of 6 cases which preoperatively showed hæmolytic streptocccci in the wound, 5 had infective complications. This encourages the belief that local penicillin will increase the scope and diminish the complications of these late closures.

Vascular complications.—These are ischæmic necrosis and hæmatoma. Ischæmia caused a major loss in two of the rotation flaps. In each case the sloughs were excised and the raw area covered with split skin between the 10th and 15th day. There were 4 large hæmatomata (1–2 oz.) in the whole series, and 3 of these were in shoulder and back closures.

CONCLUSIONS

Late wounds are best closed by a radical attack which—by excision of granulations, the fibrotic base, and the new skin back to good surgical material—aims at reconstitution of the original defect in a clean field. This defect is then closed at the same operation.

Closure from local tissue is possible in most of these wounds, and closure in as straight a line as possible gives the best functional results and earliest sound healing.

Direct approximation and secondary suture, after wide undermining, is the most widely applicable method (40% in this series); but more distant tissue may be made available by transferring it over the defect on a swing

TABLE II—CLOSURES BY FREE GRAFT ALONE (9 cases)

Case	Age of wound (wk.)	Site	Size (cm.)	Bacteria *	Type of graft	Take %	Healing (days)
55	8	Popl. fossa	9 × 6	*Staph. aur.* (Sterile)	TSG	100	10
56	4	R. calf	8 × 7	*Staph. aur.*	PSG	90–95	10
57	6	R. thigh	18 × 10	Hæm. strep. (*Staph. aur.* KLB)	DG	90–95	14
58	9	R. thigh	10 × 10	Sterile (KLB)	TSG	90–95†	E
59	4	Patella and R. knee	15 × 5	*B. coli, Staph. aur.*	PSG	90–95	10
60	4	Sole of ft	12 × 7	*B. coli, Staph. alb.* (*Staph. aur.*)	PSG	100	E
61	2	R. forearm	6 × 12	*Staph. aur.* KLB (ditto)	TSG	80†	E
62	10	R. buttock	6 × 2	Sterile (Sterile)	TSG	80	17
63	..	Thigh stump (traum. amp.)	1000 sq. cm.	Hæm. strep. (Sterile)	DG	90–95	35

TSG = a thin sheet of split skin; PSG = thin squares (1 sq. cm.) of split skin packed close together; DG = sheet of skin 5/1000 in. thick, cut with dermatome; E = evacuated.
* Bacteriology after operation in parentheses.
† Late breakdown of graft, owing to KLB.

TABLE I

A.—CLOSURES BY APPROXIMATION AND SECONDARY SUTURE (30 cases—4 in text)

Case	Age of wound (wk.)	Site	Size* (cm.)	Undermining (cm.)	Bacteria †	Complications	Healing (days)
5	16	L. buttock	9 × 12 (16 × 11)	8–9	Sterile (*Staph. aur.*)	..	12
6	6	R. buttock	6 × 13	6–8	*B. prot.* (*B. prot.*)	2 stitch absc.	21
7	22	R. buttock	7 × 3	5–6	Hæm. strep. (*Staph. aur.*)	Low-grade cellulit. of edge	17
8	30	R. thigh	9 × 10	3–5	*Staph. aur.* (*Staph. aur.*)	..	12
9	6	R. thigh	10 × 7 (15 × 11)	6–8	..	..	12
10	17	Thigh	6 × 4 (16 × 8)	8	..	..	14
11	4	Thigh	3 × 2 (7 × 3)	2–3	Hæm. strep.	Moist edges	17
12	26	Thigh	10 × 6	..	..	..	10
13	12	Thigh	7 × 4	..	*Staph. aur.* (Sterile)	..	10
14	17	Thigh	20 × 4	..	KLB	..	14
15	6	L. thigh	14 × 7 (15 × 9)	..	..	Stitch absc., edge redness	28
16	30	Thigh	7 × 2	3–5	*Staph. aur.*	..	10
17	22	Thigh	6 × 2	5–6	Hæm. strep. (*Staph. aur.*)	Diffuse edge redness	17
18	10	L. Thigh	7 × 2	..	..	Broke open 14th day on walking. Resuture	28
19	22	L. calf	11 × 2 (12 × 5)	5–7	*Staph. aur.* (Sterile)	..	10
20	26	Shin	11 × 2		*Staph. aur.*	..	10
21	6	R. calf	5 × 3	3–5	*Staph. aur.* (*Staph. aur.*)	..	10
22	4	L. leg	12 × 5	..	KLB (Sterile)	Hæmatoma	21
23	6	Calf	7 × 2	..	Sterile	..	14
24	22	R. shin	12 × 3	..	*B. prot.*	Stitch absc.	21
25	8	R. forearm	13 × 4 (25 × 9)	6–10	Sterile	..	8
26‡	12	L. forearm	18 × 7	6–8	Hæm. strep.	..	10
27	2	R. elbow	5 × 8 (14 × 6)	4–5	Hæm. strep.	Stitch absc.	17
28	6	L. axilla	8 × 4	6–8	..	Infective edge loss, Th.G	28
29	6	R. shoulder	6 × 2	2–4	Hæm. strep.	Low-grade cellulit. of edge	21
30	22	L. scapula	9 × 4	..	KLB (*Staph. aur.*)	Hæmatoma	14

B.—CLOSURES BY SWINGING FLAPS (9 cases)

Case	Age of wound (wk.)	Site	Size* (cm.)	Bacteria †	Complications	Healing (days)
31	6	L. loin	7 × 10	*Staph. aur.* (*Staph. aur.*)	..	12
32	10	R. groin	11 × 8	..	Recurr. low-grade cellulit.	21
33	6	Groin	15 × 13	..	Infective edge loss, Th.G	28
34	33	Groin	8 × 8	..	Infective edge loss, Th.G	35
35	8	Thigh	6 × 6	Sterile (*Staph. aur.*)	..	21
36	4	Post. thigh	16 × 11 (20 × 30)	Sterile (Sterile)	Patchy edge ischæmic necrosis, Th.G	21
37	4	Mid-shoulder	15 × 6	Hæm. strep. (Hæm. strep.)	Hæmatoma, some edge separation; resuture	42
38	8	L. shoulder	4 × 10	(Hæm. strep.)	Postop. hæmatoma; gaping; resuture	28
39	12	L. shoulder	(25 × 10)	..	..	14

C—CLOSURES BY ROTATION FLAPS (15 cases)

Case	Age of wound (wk.)	Site	Size* (cm.)	Bacteria †	Complications	Healing (days)
40	17	L. hip	7 × 5	..	..	17
41	13	L. groin	15 × 10	..	..	21
42	13	Loin and buttock	18 × 14 (28 × 30)	Sterile (KLB)	Edge necrosis, infection	E
43	4	L. popl. fossa	10 × 7	KLB (*Staph. aur.*)	3 × 2 cm. ischæmic edge loss, Th.G	28
44	26	R. shin	(11 × 33)	Sterile	..	14
45	2	R. shin	7 × 6 (12 × 9)	*Staph. aur.*	..	21
46	17	R. calf	(7 × 7)	Sterile (KLB)	..	10
47	30	R. shin	7 × 1	*Staph. aur.*	Superfic. progressive skin loss	E
48	17	Sole of foot	6 × 1	..	..	14
49	14	L. elbow	(10 × 15)	..	..	21
50	14	L. arm	5 × 5	..	..	14
51	10	R. mastoid	3 × 12	..	..	6
52	3	Mastoid and ear	3 × 2	..	..	6
53	2	Neck	6 × 4	..	..	6
54	2	Cheek	2 × 3	..	Subcut. absc.	14

Measurements are maximum diameters.
Th.G = edge loss covered by thin Thiersch graft between 10th and 15th day. E = evacuated.
* Size after excision in parentheses.
† Bacteriology after operation in parentheses. ‡ See fig. 4.

or rotation flap in a good percentage of cases (33% of this series).

The upper limit of these local closures in the trunk, and proximal parts of the limbs, lies between 80 and 200 sq. cm., depending on the site of the defect. Defects of 80 sq. cm., in elbow or upper calf regions, can be closed by local tissue, using rotation flaps; and abdominal and flank tissue up to 200 sq. cm. can be made available for trunk defects.

There is no contra-indication to a free graft if it will take; but earlier and sounder healing is obtained when local tissue can be made to close the wound. A wound more than 6–8 weeks old does not offer a good prospect for 100% take and sound healing of the graft. A free graft is nearly always necessary, at least in part, for defects of more than 120 sq. cm. In such large defects the free graft can often with advantage be combined with a local flap to provide both a skin and fat cover for special parts of the wound.

TABLE III—CLOSURES BY COMBINED OPERATIONS (15 cases)

Case	Age of wound (wk)	Site	Size * (cm.)	Bacteria †	Operation	Complications	Healing (days)
64	4	L. popl. fossa	28 × 7	*Staph. aur.*	SS; RF TSG sec. defect.	Ischæm. necr. 4 × 3 R. flap; Th.G	28
65	8	,,	20 × 10	Pyocy. (KLB)	SS; SF	..	17
66	26	,,	13 × 5	Sterile (Pyocy.)	SS; TSG	Scarlatina stitch absc.	28
67	22	,,	16 × 3 (23 × 6)	KLB (Sterile)	SS; TSG	..	14
68	6	L. upp. popl. fossa	10 × 10	..	SF; TSG	Ischæm. necr. edge of flap; Th.G	28
69	30	R. thigh	15 × 10	*Staph. aur.* (*Staph.aur.*)	SS; TSG	..	14
70	4	L. thigh	23 × 6	Sterile	SS; TSG	..	14
71	13	L. shin	6 × 4 (7 × 6)	Sterile (*Staph.aur.*)	SF; TSG	..	28
72	22	L. ankle	5 × 7	*Staph. aur.* (*Staph.aur.*)	SF; TSG	..	28
73	22	L. calf	7 × 3	..	SS; TSG	..	14
74	22	Back L. calf	9 × 7	Hæm.strep. (*B. coli*)	SF; TSG	..	21
75	2	L. fore-arm	11 × 30	Sterile	SS; DG	..	14
76	6	L. elbow	10 × 10	(KLB and hæm. strep.)	RF; TSG	30% loss of graft	56
77	17	L. hand	6 × 3	*Staph. aur.* (Pyocy.)	SS; direct abd. flap	..	49
78	22	L. wrist	3 × 4	..	SS; TSG	..	21

SS = direct approximation and secondary suture; TSG = a thin sheet of split skin; SF = swinging flap; RF = rotation flap; DG = dermatome graft; TH.G = edge loss covered by thin Thiersch between 10th and 15th day.

* Size after excision in parentheses.

† Results of culture after operation in parentheses.

With increasing use of delayed primary suture and early secondary suture, combined with local penicillin, the percentage of wounds needing late closure may be expected to decline sharply.

Soft-tissue wounds, however extensive, should all be soundly healed within 6 weeks of the injury. The surgeon must be able to achieve this for his cases, or else should send them early to a centre equipped to do so.

These results represent the work of a whole surgical unit. In it are incorporated cases treated by Captain Rex Lawrie, the benefit of whose opinion at operation and care in the wards was given to most of the cases.

This is not the orthodox operative treatment of wounds, nor the routine work of this unit, and the early establishment of a simple and routine theatre technique, which worked smoothly, was made possible by the efficiency and the suggestions of the theatre staff under Nursing Officer P. Clutton, QAIMNSR.

Many of these operations lasted over two hours. There were no postoperative complications due to the anæsthetics, which were given by Captain G. K. T. Roche, on whose plasma and blood administrations the surgeon could always rely without himself having to keep close check on the general condition of the patient.

INACTIVATION OF PENICILLIN BY SERUM

JOSEPH W. BIGGER, M D, SC D DUBL., F R C P, F R C P I
LIEUT-COLONEL RAMC

IN an experiment in which penicillin was titrated against *Staphylococcus pyogenes* in broth and in 75% serum in water, the results given in table I were obtained.

Until this experiment was performed, I had supposed that serum had no prejudicial effect on the antibacterial activity of penicillin. Such certainly was the impression created by the literature available. But in this experiment the serum used appeared to contain a penicillin-neutralising agent.

The serum (A) which had been Seitz-filtered before being used was more than 2 years old; it had been discarded as unsuitable for transfusion owing to its turbidity, but was sterile on culture. It was considered probable that it had in some way acquired quite abnormal antipenicillin properties; and this seemed worth investigating.

The penicillin used in this work was the sodium salt (TRC). It was derived from the residues remaining in the bottles after the treatment of a case. The strain of *Staph. pyogenes* was the one used in the School of Pathology, Oxford, for assaying penicillin.

The following simple experiment was first carried out.

A solution of penicillin was made in sterile distilled water of such a strength that each 1 c.cm. contained 4 Oxford (Florey) units. Distilled water, broth, and fresh unfiltered sterile human serum were added to equal volumes of the penicillin solution, giving 2 units of penicillin per c.cm. in water, in 50% broth and in 50% serum. Each of these mixtures was divided into two parts, one of which was kept at 0° C. and the other at 37° C. for 24 hours, when their penicillin contents were compared, on plates spread with *Staph. pyogenes*, with one another and with standard solutions of penicillin containing 2, 1 and 0·5 units per c.cm. The zones produced on the plates by each of the fluids kept at 0° C. and by water and broth kept at 37° C. were indistinguishable from one another and from those produced by 2 units per c.cm. of penicillin, but the zone of the sample kept in contact with serum at 37° C. was very much smaller than that produced by 0·5 unit per c.cm.

The results of this experiment (1) and of a number of others of a similar type are summarised in table II.

Great accuracy is not claimed for the assays of penicillin recorded, since, no cylinders being available, the test fluids were introduced into holes cut out of the agar of the inoculated plates with a cork-borer, and usually not more than one plate was used for each assay in place of the four which the full technique requires. Further, the plate method is unsatisfactory for assaying low concentrations of penicillin. Confirmation of the results was provided by other methods of assay.

TABLE I—PENICILLIN TITRATIONS IN BROTH AND IN SERUM-WATER, AGAINST *Staph. pyogenes*

Tube	Penicillin (units per c.cm.)	24 hours' incubation		72 hours' incubation	
		Broth	Serum-water	Broth	Serum-water
1	3/4	−	−	−	−
2	3/8	−	−	−	+
3	3/16	−	−	−	+
4	3/32	−	−	−	+
5	3/64	−	±	+	+
6	3/128	−	+	+	+
7	3/256	+	+	+	+
8	3/512	+	+	+	+
Control	0	+	+	+	+

− = fluid clear: no growth on agar. ± = fluid clear: growth on agar. + = fluid turbid: growth on agar.

The fractions of serum G (expt. 4) were tested by the slide-cell method with the results shown in table III.

The activity of the penicillin after 24 hours' contact with 80% serum at 37° C. was between $\frac{1}{4}$ and $\frac{1}{8}$ of that which had been in contact with the same serum for the same time at 0° C.

The samples of water and serum H (expt. 5) were similarly titrated in slide-cells, and in tubes with broth as diluent; lack of inhibition was shown by turbidity. The results are given in tables IV and V.

TABLE II—ESTIMATES OF PENICILLIN (ORIGINALLY 2 UNITS PER C.CM.) AFTER CONTACT WITH SERUM OR OTHER FLUIDS AT VARIOUS TEMPERATURES

Expt.	Fluid	Duration of contact: At 0° C. (hr.)	At 18-20° C. (hr.)	At 37° C. (hr.)	Units per c.cm. after contact
1	Water	24	..	..	2·0
		..	..	24	2·0
	Broth (50%)	24	..	..	2·0
		..	..	24	2·0
	Serum A (50%)	24	..	..	2·0
		..	..	24	< 0·5 (? 0·2)
2	Serum B (80%)	22	..	..	1·4
		..	..	22	< 0·5 (? 0·3)
	Serum C (80%)	22	..	..	1·1
		..	..	22	< 0·5 (? 0·4)
	Serum D (80%)	22	..	..	1·2
		..	..	22	< 0·5 (? 0·2)
	Serum E (80%)	22	..	..	2·0
		..	..	22	0·6
3	Serum F (90%)	19	..	..	1·5
		..	19	..	1·3
		..	..	19	< 0·5 (? 0·4)
	Serum F (50%)	19	..	..	1·5
		..	19	..	1·4
		..	..	19	0·5
	Serum F (10%)	19	..	..	1·7
		..	19	..	1·5
		..	..	19	1·1
	Serum F (50%) with broth (40%)	19	..	..	1·4
		..	19	..	1·2
		..	..	19	0·5
4	Water	24	..	..	2·0
		..	..	24	2·0
	Serum G (80%)	24	..	0	1·8
		21	..	3	1·4
		18	..	6	1·2
		12	..	12	0·75
		0	..	24	< 0·5 (? 0·3)
5	Water	24	..	..	2·0
		..	..	24	1·9
	Serum H (90%)	24	..	..	1·8
		..	..	24	< 0·5 (? 0·2)
6	Serum I (80%)	22	..	..	1·9
		..	..	22	< 0·5 (? 0·1–0·2)
	Serum J (80%)	22	..	..	1·9
		..	..	22	< 0·5 (? 0·1–0·2)
7	Blood K (90% citrated)	23	..	..	1·5
		..	..	23	< 0·5 (? 0·4)
	Blood K (90% defibrinated)	23	..	..	1·8
		..	..	23	0·8

Expt. 6 was performed because it had been observed that one of the sera, which in an earlier experiment had inactivated penicillin to a considerable degree, was very fatty.

Sera I and J were from the same normal man. They were derived from bleedings on the same day with an interval of 2 hours between. Serum I was from blood taken 4½ hours after breakfast, serum J from blood taken 1½ hours after lunch which, on this occasion, was larger than usual and included 1 pint of milk. Serum I was quite clear, serum J was cloudy owing to the presence of fat. The sera, which were titrated in slide-cells and tubes after 24 hours at 37° C., showed no significant difference in their penicillin content.

This appears to show that the inactivating power of serum is independent of its fat content. All that can be stated with certainty is that the ability to inactivate penicillin is due to one or more of the stable constituents of serum.

TABLE III—EFFECT OF CONTACT OF PENICILLIN WITH 80% SERUM AS JUDGED BY SLIDE-CELL METHOD. DILUENT, 1 : 10 SERUM IN SALINE. ORGANISM, *Staph. pyogenes*

Temperature	Duration of contact (hours)				
0° C.	24	21	18	12	0
37° C.	0	3	6	12	24
Dilution					
1 : 1	−	−	−	−	−
1 : 2	−	−	−	−	−
1 : 4	−	−	−	−	+
1 : 8	−	−	−	−	+
1 : 16	−	−	−	±	+
1 : 32	−	−	+	+	+
1 : 64	±	+	+	+	+
1 : 128	+	+	+	+	+
Control ..	+	+	+	+	+

− = no colonies. ± = colonies few and small. + = colonies normal in size and number.

The apparently small loss of activity of penicillin which had been in contact with citrated or defibrinated blood (expt. 7) is explained by the findings of Rammelkamp and Keefer (1943) that the cells take up very little penicillin and that, when penicillin is added to blood, almost all of it is to be found in the serum or plasma.

TABLE IV—EFFECT ON PENICILLIN OF 24 HOURS CONTACT WITH WATER AND 90% SERUM H AS JUDGED BY SLIDE-CELL METHOD. DILUENT, 1 : 10 SERUM IN SALINE. ORGANISM, *Staph. pyogenes*

TABLE V—EFFECT ON PENICILLIN OF 24 HOURS CONTACT WITH WATER AND 90% SERUM H AS JUDGED BY GROWTH OF *Staph. pyogenes* IN BROTH

Dilution	TABLE IV: Water 0° C.	Water 37° C.	90% serum 0° C.	90% serum 37° C.	TABLE V: Water 0° C.	Water 37° C.	90% serum 0° C.	90% serum 37° C.
1 : 2	−	−	−	−	−	−	−	−
1 : 4	−	−	−	±	−	−	−	±
1 : 8	−	−	−	+	−	−	−	+ +
1 : 16	−	−	−	+	−	−	−	+ + +
1 : 32	−	−	−	+	−	−	−	+ + +
1 : 64	−	−	−	+	+	+ +	+	+ + +
1 : 128	±	+	+	+	+ +	+ +	+ +	+ + +
1 : 256	+	+	+	+	+ + +	+ + +	+ + +	+ + +
Control	+	+	+	+	+ + +	+ + +	+ + +	+ + +

− = no colonies. ± = colonies few and small. + = colonies normal in size and number.

− = broth clear: no growth on agar. ± = broth clear: growth on agar. + = broth v. sl. turbid. + + = broth mod. turb. + + + = max. turb.

It may therefore be assumed that, in this experiment, the initial concentration of penicillin in the serum or plasma was between 3 and 4 units per c.cm. and not 2 units per c.cm. which was the concentration in the sera in the other experiments.

The experiments which have been recorded prove that both serum and blood inactivate penicillin and that this inactivation varies greatly in degree with different samples of serum but is always much greater at 37° C. than at lower temperatures.

There can be no question of this inactivation being due to the presence in the serum or blood, of penicillinase produced by penicillin-resistant bacteria. This might explain the results given by serum A as recorded in tables I and II. It is improbable in the case of the freshly filtered serum F, and it is quite impossible in the case of the 8 other sera and one blood, since all these were used within 24 hours of bleeding, were not filtered, and were found to be sterile.

The inactivation of penicillin by high concentrations of serum is of importance chiefly in relation to the therapeutic use of penicillin, but it may be noted that this inactivation may lead the bacteriologist to underestimate the amount of penicillin in the serum of a patient, particularly when the concentration is low.

TABLE VI—DILUTIONS OF PENICILLIN IN SERUM TITRATED BY SLIDE-CELL METHOD. DILUENT, 1 : 10 SERUM IN SALINE. ORGANISM, *Staph. pyogenes*

Units per c.cm. penicillin	After 15 hr. incubation: A (1)	B (½)	C (¼)	D (⅛)	After 23 hr. incubation: A (1)	B (½)	C (¼)	D (⅛)
Dilution								
1 : 1	−	−	−	−	−	−	−	−
1 : 2	−	−	−	−	−	−	−	±
1 : 4	−	−	±	+	−	−	+	+
1 : 8	−	−	+	+	−	−	+	+
1 : 16	−	+	+	+	−	+	+	+
1 : 32	+	+	+	+	+	+	+	+
1 : 64	+	+	+	+	+	+	+	+
Control	+	+	+	+	+	+	+	+

One unit of penicillin in serum titrated in slide-cells usually gives: 1 : 8, − ; 1 : 16, − ; 1 : 32, +.
Occasionally the reading may be: 1 : 8, − ; 1 : 16, ± ; 1 : 32, +.
Or: 1 : 8, − ; 1 : 16, − ; 1 : 32, ±.

A mixture of serum, water and penicillin was made so that the mixture contained 95% of serum and 1 unit of penicillin per c.cm. This was diluted with pure serum so as to give 3 further preparations containing respectively $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ units per c.cm. These were tested as usual in slide-cells using *Staph. pyogenes* as the test organism and 1 : 10 serum in saline as diluent. The results, as recorded after 15 and 23 hours' incubation, are given in table VI.

If we take the result " — at 1 : 16 " as indicating the presence of 1 unit per c.cm., the results (15 hours' incubation) of A, B and D are in order but C appears to contain between $\frac{1}{4}$ and $\frac{1}{8}$ unit per c.cm. instead of the $\frac{1}{4}$ unit which it actually contained. In the case of the 23 hours' incubation results, C appears to contain $\frac{1}{8}$ unit per c.cm. and D between $\frac{1}{4}$ and $\frac{1}{16}$ unit per c.cm. instead of the $\frac{1}{4}$ and $\frac{1}{8}$ unit per c.cm. which they respectively contained.

This distortion is due to the inactivation of the small amounts of penicillin present in the 1 : 4 dilution of preparation C and in the 1 : 2 dilution of preparation D by the high concentrations of serum in these tubes—32% in the first and 55% in the second. With weak concentrations of serum inactivation is slow and penicillin persists in sufficient strength to prevent colony formation even when incubation is unduly prolonged. Errors are most likely to occur when the content of penicillin in the patient's serum is low, when serum stronger than the recommended 1 : 10 dilution is used as diluent or when the period of incubation is prolonged much beyond 12 hours.

Another source of error in assaying the penicillin in the serum of a patient (to which attention has been directed by Fleming 1943) is delay in setting up the test. Incubating the specimen of blood in order to facilitate the separation of serum may considerably reduce the activity of the penicillin present, but even at low temperatures the loss of activity in less than 24 hours may be sufficient to affect the results.

DISCUSSION

Chain and Florey (1944) state : " It was therefore a particularly fortunate property of penicillin that pus, tissue autolysates, blood and serum had no inhibitory effect on its activity " ; and this statement has been repeated by other writers on penicillin. I think it originated in the important paper by Florey and his collaborators (Abraham et al. 1941) which records that " incubation for 3 hours at 37° C. of penicillin with blood and with slices of liver, kidney, spleen, brain, muscle, lymph-gland, lung and intestine from the rabbit causes no detectable destruction." If human blood had been used, and if the period of incubation had been extended, inactivation (which is probably equivalent to destruction) of penicillin would have been detected.

In the same paper an experiment is described in which penicillin diluted with human serum was placed on top of a column of glucose agar inoculated with staphylococci. After incubation the depth of the clear portion of the column in which growth had not occurred was the same as when no serum was present. The conclusion drawn was : " Serum, therefore, in no way interferes with the action and diffusibility of the substance." The inhibition by penicillin of growth of *Strep. pyogenes* in whole human blood in slide-cells is also adduced in support of the belief that neither blood nor serum interferes with the bacteriostatic properties of penicillin.

Rammelkamp and Keefer (1943) carried out an experiment in which whole blood, serum or cells were added to a solution of penicillin and serial dilutions of the mixtures were made in broth. Hæmolytic streptococci were used as the test organism and it was found that the addition to the penicillin had not altered the end-point. From this it was concluded that " these 3 substances do not inhibit the antibacterial action of penicillin."

The only hint that serum or blood may inactivate penicillin is given by Fleming (1943) : " The blood should be tested within a few hours of its withdrawal or, if the examination has to be postponed till next day, it must be stored in the refrigerator. If kept for 24 hours at room temperature the small amount of penicillin contained in the blood-serum may lose part or all of its activity." From this it is clear, however, that Fleming attributed the loss of activity to the high temperature rather than to the combined action of serum and temperature.

The observations here recorded prove that human blood and serum have, in vitro, considerable power of inactivating penicillin and that this inactivation takes place more rapidly at high temperatures than at low. The mechanism of inactivation has not been discovered. There is no reason to doubt that the same inactivation can occur in vivo.

The body loses penicillin mainly by the kidneys and Florey has compared the struggle to maintain an adequate concentration of penicillin in the blood to an effort to keep a bath full with the plug out. If penicillin is constantly being inactivated by the plasma, we might liken the process to the efforts to fill a bath with hot water when the plug is out and the cold tap running. In view of the supply difficulty, we might even add to our picture a boiler-man highly conscious of the need of economy in fuel.

The experiments recorded here deal only with the inactivation of penicillin at such high levels as 2 units per c.cm. Such data as are available suggest that the loss in blood might be of the order of 5% per hour. As compared with the loss by way of the kidneys, this is small ; but it cannot be considered negligible, and at lower levels the rate of loss is possibly greater. My results show substantial differences in the rate of inactivation of penicillin by different sera ; in the body, the loss through contact with the blood might, in some patients, be considerable.

Rammelkamp and Keefer (1943) showed that the proportion of penicillin excreted by the urine varied widely (37–99%) in different individuals. When penicillin was administered intravenously the proportion leaving the body with the urine was high, but when routes permitting slow absorption were used the percentage recovery from the urine was lower. In 2 patients with renal failure, penicillin persisted in the blood after intravenous introduction for the unusually long period of 6 hours. One excreted only 14% of the penicillin administered in 6 hours and the other only 12% in 13 hours as compared with 5·7% in one hour by a normal man. They believe that these observations " support the view that penicillin is inactivated in the body " but are unable to explain how or where this inactivation occurs. My findings suggest that, when excretion by the urine is delayed, a large proportion of the loss is due to the action at body-temperature of the blood.

Rammelkamp and Bradley (1943) found that the administration of ' Diodrast' (*BP* diodone) delays the excretion of penicillin. They record that after diodone-penicillin administration, only 32% of the penicillin administered was excreted in the urine as compared with 57% following the administration of penicillin alone. This, they say, " confirms the previous suggestion that the degree of ' inactivation ' of penicillin is related to the time of exposure within the body."

These observations give strong support to the belief that penicillin is inactivated in the body by contact with the blood.

Penicillin, administered intravenously, spreads from the blood-vessels into the tissues. An investigation of the effect on penicillin of the tissue fluids might be valuable.

CONCLUSIONS

Penicillin is inactivated by contact with human serum or blood. The degree of inactivation varies greatly with different specimens of serum ; and is much greater at body temperature than at lower temperatures.

This inactivation may lead to underestimation of the amount of penicillin in a patient's serum. Inactivation in vivo is probably important chiefly in cases in which excretion of penicillin by the kidneys is slow.

I acknowledge with gratitude the information placed at my disposal by Sir Alexander Fleming and by Professor Gardner and his colleagues in the Sir William Dunn School of Pathology, Oxford ; the human serum supplied by Dr. W. S. Stanbury, and the help afforded to me during the course of the work by Captain G. E. Thomas, Captain J. Colquhoun, and Lieut. W. G. D. Caldwell, and by the laboratory assistants in the Army Laboratory in which the work was carried out.

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OLIGURIA IN BLACKWATER FEVER

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THE published work on oliguria in blackwater fever has recently been reviewed by Foy and others (1943). Analysis of the clinical and pathological findings in 35 cases of blackwater fever complicated by renal insufficiency, observed in the West Africa Command between 1941 and 1943, 33 of them being fatal, has led us to two conclusions—

(*a*) The failure of kidney function is not essentially brought about by blockage of the tubules with debris and hæmoglobin products.

(*b*) One of the more probable causes of renal failure is an alteration in the distribution of the blood-flow through the kidney whereby circulation through the glomerular capillary beds is so reduced that filtration is grossly restricted. Such alteration of blood-flow through the kidney is concomitant with atonic collapse of the general peripheral vascular system. Recovery of the circulation restores the glomerular flow and consequently filtration. Reduction of hydrostatic blood-pressure within the glomerular capillary beds, though it may sometimes be important in limiting glomerular filtration, does not appear to be the only factor in promoting renal failure in blackwater fever. Thus persistent reduction of systemic blood-pressure to levels incompatible with glomerular filtration was not observed in West African cases, although there was in most cases a sharp fall of both systolic and diastolic pressures immediately before the development of anuria, followed by a gradual rise during the anuric period. In this connexion, however, it must be remembered that small changes in the peripheral systemic blood-pressure are not always mirrored in the renal circulation (Fahr and Esshler 1941).

The evidence on which the above conclusions are based comes from entirely military sources.

EVIDENCE AGAINST TUBULAR BLOCKAGE AS THE CAUSE

The degree of tubular blockage revealed by histological examination was not sufficient to interfere seriously with urinary secretion, in view of previous work which has shown that the kidney functions with a normal reserve of 60–80% (Barker 1940), and that large portions of kidney substance may be removed or damaged without gross interference with urinary flow (Wood and Etheridge 1932). Oliguria developed in cases in which a minimum of blockage could be demonstrated post mortem, although the patients died in an anuric state. Sections of kidneys of cases which have recovered from oliguria but died shortly after from other causes—e.g., heart-failure—exhibited degrees of blockage similar to those found in cases dying during anuria. Extensive blockage of tubules was observed in cases which did not develop oliguria or anuria. Patients sometimes recover from oliguria, but the urine passed after recovery does not always contain the masses of debris and tubular casts that might be expected if the urinary flow had been obstructed simply by plugged tubules. On the contrary, urine in the post-anuric phase is usually clear and contains few casts and little debris.

Histological examination of the kidneys of our patients who died in anuria did not always reveal evidence of dilatation of the capsular spaces and proximal tubules, such as might be expected to result from increased intracapsular pressure resulting from tubular blockage. In our cases the reaction of the urine did not bear any direct relation to the development of oliguria or anuria, as would be expected if the primary factor in renal obstruction were blockage of the uriniferous tubules by products of hæmoglobin precipitated from acid urine. Thus in some cases the urine remained strongly acid throughout the illness but kidney failure did not supervene. In other cases renal failure developed although the urine remained alkaline. In one case oliguria appeared after the urine had been rendered alkaline for some days by treatment.

The fact that the anuric state in blackwater fever is reversible (two of our cases recovered completely) is a strong argument against the theory that the kidney failure develops primarily because of blockage of the renal tubules; it seems more likely that it develops as the result of altered physiological conditions, such as temporary depression of glomerular filtration resulting from altered vascular flow.

EVIDENCE FOR CHANGES IN RENAL BLOOD-FLOW WITH PERIPHERAL CIRCULATORY COLLAPSE

The kidneys of patients who have died in anuria show:

(i) Intense congestion and dilatation of the vessels of the medulla, often with rupture of the vessels into tubules.

(ii) Relative anæmia of the cortex, the glomerular capillaries being usually empty or nearly so; Turnbull (Witts 1929) and De Navasquez (1940) observed bloodless glomerular tufts in cases of incompatible transfusion, and Bywaters and Beall (1941) in crush kidney.

(iii) A variable degree of congestion and engorgement of the vessels of the subcapsular plexus.

The histological appearance of the kidneys suggests that the blood-flow through the cortex has been mainly by-passed, most blood passing into the medullary vessels and some running direct through the cortex to the subcapsular vessels. The glomerular flow may thus be to a large extent short-circuited, possibly along vessels similar to those previously described in the rabbit (Maegraith and MacLean 1942, Smith 1940).

In the few cases examined some evidence of parallel atonic changes in the peripheral circulation has been obtained.

Skin vascular reactions to light stroking.—In blackwater fever complicated by anuria the white line was difficult to elicit, and if present occurred as a series of white blotches rather than a thin line. When white reactions were obtained they could be obliterated by counteracting venous pressures lower than those needed to overcome the normal response; and they would not develop when opposed by even very low venous pressures. These abnormal white responses suggested that in the patients concerned the minute skin vessels were contracting less powerfully and remaining contracted less efficiently than in healthy subjects—i.e., they were atonic. Atonia of the small skin vessels was further shown by the ease with which a red-blue response could be obtained, the reaction developing almost immediately after stroking. In some cases poor flare responses were also noted, indicating feeble arteriolar reaction. In very severe cases almost all skin vascular responses sometimes failed to develop after stroking. In cases which have recovered, skin responses returned to normal. Further examination of the state of the skin vessels and the blood-flow through them on the lines of the investigations of Di Palma (1941, 1942, 1943) would repay observation.

Liver changes.—In most fatal cases of blackwater fever the central vein and the vessels surrounding it are very congested. Cellular changes ranging from slight granular degeneration to frank necrosis are also often present in the same region. Such congestion and cellular degeneration indicate interference with the venous drainage from the liver, which must be either passive, resulting from heart-failure, or active, arising from obstruction to the blood-flow through the hepatic veins and venules. Since the clinical signs of heart-failure develop late in the disease, if at all, we consider that the latter alternative is more likely—that there is an active contraction of the smooth muscular coats of the hepatic venules and veins, including the annular sphincters at the vena ostia (described by Snyder in 1942 as "canal lock" or "sluice boxes"). Such constriction of the hepatic veins and venules with consequent damming up of liver blood is not inconsistent with accompanying general peripheral vascular collapse, since it can be shown to occur under experimental conditions in fatal serum shock in dogs.

Lesions of the kidney tubules.—In this series of cases, in addition to a variable degree of cast formation and

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apparent blockage of tubule lumina by pigmented granular material, degenerative changes were observed in the nuclei and cytoplasm of the cells of the convoluted tubules and loops of Henle. Such lesions are, as already noted by Bywaters and Dible (1942), very similar to those seen in crush syndrome, incompatible blood-transfusion, concealed retroplacental hæmorrhage (Young 1942), the trauma of labour (Young and McMichael 1941), excessive vomiting associated with pyloric stenosis and alkaline treatment (McLetchie 1943), and cholera (Tomb 1942). In fatal cases of yellow fever, where there is excessive vomiting and frequently oliguria or anuria, the localisation of tubular lesions is similar. The particular distribution of the lesions found in the above conditions has given rise to considerable discussion. We suggest that the by-passing of the blood-flow through the cortex may be partly responsible for the degenerative changes seen in these highly specialised cells, which are known to be readily damaged by interference with their blood-supply. Other factors, such as anoxia resulting from malarial infection (Rigdon 1942) and reduction in numbers of oxygen-carrying red cells, are possibly also involved.

DISCUSSION

The oliguria of blackwater fever may be in part due to peripheral vascular atonic collapse with subsequent redistribution of intrarenal blood-flow and depression of glomerular filtration. Blockage of the renal tubules does not appear to be the deciding factor. The degenerative changes seen in the renal epithelium are probably assisted by anoxia resulting from inadequacy of the altered circulation.

The part played by hæmoglobin in the production of oliguria and anuria in blackwater fever is not established. The recorded effects of circulating hæmoglobin on the kidneys in animal experiments (Yuile 1942 and others) vary with the observer, but it has been shown that large amounts of hæmoglobin can pass through the kidney without inflicting serious damage on the organ (Yuile 1942). It appears likely, therefore, that the kidney lesions seen in blackwater fever, &c. are not primarily the result of damage due to the passage of hæmoglobin. The effects of the passage of similar amounts of hæmoglobin upon tissues already damaged by circulatory failure, or by some circulating chemical substance, have yet to be determined. The hæmoglobin may prove to have no other effect than that of pigmenting already existing casts and necrotic debris.

The cause of the vascular collapse which we believe occurs in blackwater fever is unknown. It may be the same factor as that which influences the balance between lytic agent and inhibitor, and so gives rise to the excessive red-cell lysis (Maegraith, Findlay and Martin 1943), or it may be something entirely different. In any case we consider that one of the fundamental features of blackwater fever is a lowering of the tone of the peripheral vascular system and that anuria is a manifestation of the ultimate vascular collapse.

SUMMARY

Blockage of the renal tubules with debris and hæmoglobin products is not the deciding factor in the production of oliguria in blackwater fever.

Observation of the reactions of the skin to stroking, and of the hepatic vessels at autopsy, suggest that peripheral vascular atony is present in blackwater fever, and it is suggested that this plays a part in the production of oliguria by a redistribution of the renal blood-flow.

The changes found in the renal epithelium are thought to be due to anoxia.

Our thanks are due to Brigadier R. A. Hepple, DDMS West Africa Force, for permission to publish this paper, and to various pathologists and physicians within the Command.

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UNUSUAL RESPONSE TO DICOUMAROL THERAPY

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THE synthetic antiprothrombic substance dicoumarol, 3:3′-methylene-bis (4-hydroxy coumarin) is coming increasingly into use in cases of venous thrombosis and in other conditions where it is desired to diminish the clotting power of the blood. The present case shows some of the difficulties which may arise during the use of the drug. It also illustrates that dicoumarol may take very much longer than the usual 48 hours to act and its effect may last for some days after dosage has ceased.[1]

CASE-REPORT

A soldier, aged 19 years, was admitted to the ophthalmic department of a military hospital complaining of flashes of light before his eyes and increasing blurring of vision during the last three months. There was nothing relevant in his previous health or family history.

He was a young man of excellent physique and in good general condition. Blood-pressure 120/80 mm. Hg. Nothing abnormal was detected on physical examination with the exception of the eye findings. Vision in the right eye was reduced to perception of hand movements only at 3 ft., while the visual acuity in the left eye was 6/60. Bilateral thrombosis of the retinal veins was found. Hæmatological investigation on admission showed: red cells 5,060,000 per c.mm., hæmoglobin 14·6 g. per 100 c.cm., white cells 10,200 per c.mm. (polymorphs 61%, eosinophils 2%, lymphocytes 35%, monocytes 2%), platelets 400,000 per c.mm., bleeding time 3½ minutes, prothrombin time (Fullerton's viper-venom method [2]) 22 seconds. Kahn test on the serum was negative and the urine normal.

In view of the fact that the thrombotic process was extending and vision deteriorating it was decided to administer a course of dicoumarol with the object of diminishing the clotting power of the blood, and in the hope of checking the progress of the disease. Treatment was begun on Sept. 30, 1943, with a dose of 300 mg. of dicoumarol, and thereafter 200 mg. were given each day after the prothrombin-time had been determined. The prothrombin-time increased disappointingly slowly, reaching only 30 seconds after 13 days of treatment. Because of this slow response the dose of dicoumarol was increased to 250 mg. on the 14th day and to 300 mg. on each of the three succeeding days. The drug was then discontinued owing to the development of signs of intolerance. On the 10th day of treatment the patient complained of headache, nausea and constipation but these symptoms were relieved by 'Veganin' tablets and an enema, and for two days there was no further complaint. On the 13th day there was complaint of backache but this soon subsided and the patient remained comfortable until the 17th and last day of the dicoumarol treatment when he developed pain in the abdomen and back, and vomited several times. The earlier specimens of vomit were clear but streaks of blood appeared in the later specimens. The urine at this time showed a heavy cloud of protein on boiling, with a deposit containing hyaline and granular casts but only a small number of red blood corpuscles. There was some tenderness in both loins and diffusely over the abdomen. The blood-pressure had increased to 160/100 mm. Hg. There was no œdema and further physical examination was negative. Leucocyte count 14,600 per c.mm. (polymorphs 83%, blood-urea 40 mg. per 100 c.cm., quantitative indirect van den Bergh reaction normal (0·4 van den Bergh unit).

1. See *Lancet*, 1943, i, 612.
2. Fullerton, H. W. *Ibid*, 1940, ii, 195.

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When dicoumarol administration was stopped the prothrombin-time had reached 36 seconds. Two days later it rose to 39 seconds and gross hæmaturia began. Later this day a subconjunctival hæmorrhage appeared in the right eye and a transfusion of a pint of fresh blood was then given. This reduced the prothrombin-time to 29 seconds but free hæmaturia continued. On the fourth day after cessation of treatment the prothrombin-time reached a peak figure of 47 seconds. Subconjunctival hæmorrhage had now appeared in the left eye and had extended in the right. Hæmaturia was more profuse. A transfusion of two pints of fresh blood was given and the prothrombin-time fell to 25 seconds. Two days later, however, it had again increased to 35 seconds and a third and final transfusion of two pints of fresh blood was given. Thereafter the prothrombin-time fell to its original value of 22 seconds and remained at this level with only minor fluctuations. Gross hæmaturia continued for a further five days (eleven days in all) after which there was microscopic hæmaturia for six days before the urine became normal. All symptoms associated with the dicoumarol gradually subsided. Six days after cessation of treatment the blood-pressure had returned to normal (120/80 mm. Hg) and the blood-urea had fallen to 32 mg. per 100 c.cm. The subconjunctival hæmorrhages were gradually absorbed, only slight staining being present after three weeks. The drug appeared to be without effect on the retinal venous thrombosis.

COMMENT

The points of interest arising from this case are:

(1) The delay in the development of the antiprothrombic action of dicoumarol in a patient who later reacted strongly to the drug.

(2) The signs of gastric and renal irritation which preceded the hæmorrhage.

(3) The long period of action of the drug after its administration had been stopped. On the sixth day after cessation of treatment the prothrombin-time, which had been reduced to 25 seconds by transfusion, increased again to 35 seconds.

(4) The persistence of gross hæmaturia for six days after the prothrombin-time had returned to a normal level.

(5) The patient's ultimate complete recovery from the effects of the drug.

It is evident that at present great caution must be exercised in increasing the dose of dicoumarol when the response to ordinary dosage is unusually prolonged. In addition it is clear that in using this drug the physician or surgeon must be prepared to administer *repeated* transfusions of fresh blood should hæmorrhage occur; and a close watch must be kept on the prothrombin-time for at least a week after administration of the drug has ceased. These precautions are required because dicoumarol probably acts by cutting off the supply of promthrombin-producing cells. The action therefore persists after the drug has been stopped, until these cells recover their function. This action is in contrast to the more physiological action of heparin.

We wish to thank Colonel Wallace Benson, then officer commanding the military hospital, for permission to publish this case; and Major E. F. King, ophthalmologist at the hospital, who was in charge of the case and who suggested the treatment. The dicoumarol used was supplied by Herts Pharmaceuticals Ltd. of Welwyn Garden City.

MESENTERIC THROMBOSES IN LYMPHATIC LEUKÆMIA TREATED WITH DICOUMAROL

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AN active man of 62, a builder by trade, had good health up to the age of 45, when he began to notice shortness of breath on climbing ladders and increasing fatigue at the end of the day. He appeared anæmic but exhibited no other signs of illness, and with the occasional administration of iron, kept well until 1940. In July, 1941, he had a sharp cramp-like pain in the abdomen, with vomiting and diarrhœa, which lasted for 48 hours during some of which time he remained on duty with the Observer Corps. In September he had a similar attack, but with severer pain and more vomiting. He bore this all night and came to one of us (R. A. M. S.) next day for advice. He was anæmic (Hb. 9·3 g. per 100 c.cm.) with pulse-rate 120 per min. looked ill and was sent to bed. He made a rapid recovery, and having no signs or symptoms other than those of anæmia, was put on large doses of iron and sent on a holiday, with an arrangement for a complete overhaul on his return. During one night of this holiday he was seized with his abdominal pain and vomited "coffee grounds" until about 6 AM, but exhibited his stamina by appearing at lunch. A fortnight later he visited his doctor and mentioned the attack only to make light of it and did not refer to the coffee-ground vomit. He was seen again in December with tracheitis, but he looked extremely well and rapidly recovered.

On Feb. 12, 1942, he had a violent abdominal pain with the now familiar vomiting and diarrhœa. The pain, at first general, localised after an hour at the umbilicus. It was described as a severe cramp, coming and going with the sensation of twisting of the bowel, and was accompanied by faintness, pallor and sweating and a feeling of oppression in the chest. In addition, he complained of a "terrible ache" and weariness of the arms from the shoulders to the fingertips. Vomiting was frequent and painful, producing a little blood-stained bile; the diarrhœa consisted of small liquid and light-brown stools. The man looked in extremis. Between 4 AM and 7 PM he was seen four times, receiving gr. ¾ of morphine and gr. 1/50 of atropine during this period. At 7 PM the pain and vomiting were gone, the abdomen was soft, the pulse 110 and the BP 80/50 mm. Hg. Then a slight rigidity appeared to the right of the umbilicus. The pulse settled down to 70, the BP rose to 102/66 and the temperature was 97° F. At this time he complained of tingling in the fingers and exhibited a fine, rapid tremor. The next morning he felt sore at the umbilicus but looked a good colour, had a pulse of 62 and a BP of 104/64. He asked for food and to be allowed to get up! Nevertheless, he was kept in bed on a fluid diet and produced melæna the next day. On Feb. 23, 24 and 25, he went by taxi to the radiologist and enjoyed it. On Feb. 27 the radiologist reported a normal alimentary tract but a splenic enlargement not previously observed; unfortunately a further severe attack of pain occurred on the day before the report was received (Feb. 26). A surgeon was called in, an acute abdomen diagnosed and a laparotomy performed. The small intestine was acutely distended and some few feet of it collapsed both above and below a point where a thrombus in a branch of the superior mesenteric vein was causing an acute intestinal obstruction of the terminal ileum. The spleen was enlarged and just palpable below the costal margin.

BLOOD FINDINGS

Date	Hæmoglobin g. %	Red cells per c.mm.	White cells per c.mm.		
			Total	Lymphocytic	Granulocytic
Feb. 26, '42	13·8	4,800,000	180,000	172,000	7200
Mar. 25, '42	15·2	5,200,000	105,000	98,000	5900
July 22, '42	15·1	5,350,000	108,000	103,000	4800
X-ray Treatment Begun					
*Aug. 13, '42	13·6	5,000,000	31,000	25,000	5400
Aug. 19, '42	13·2	4,900,000	19,000	13,800	5000
Aug. 26, '42	14·9	5,200,000	11,200	6,300	3700
X-ray Treatment Stopped					
Nov. 26, '42	13·6	4,700,000	22,000	17,500	4000
June 25, '43*	12·8	4,400,000	43,000	36,000	6800
Sept. 14, '43†	13·2	4,500,000	56,400	49,000	7700
Nov. 27, '43	12·9	4,250,000	74,200	67,000	6500

* Dicoumarol begun. † Severe tracheitis.

After the operation, the shock and collapse were such that blood-transfusion was decided on. One of us (N. L.) was called in to group the patient, and took the opportunity to do a full blood-count, the result of which is given in the table. The ætiology of the intestinal obstruction was now evident and it is remarkable that the man remains alive after so long a history of apparently genuine leukæmic thrombosis. The patient made a good recovery, but after returning home had a succession of attacks of abdominal pain while on treatment with arsenic and iron, and during two of these attacks his life was again despaired of. Then attack followed attack with never more than 4 weeks freedom from them. On July 29 it was decided to give X-ray treatment to the spleen and some glands which had enlarged in the neck, axillæ and groins. The good effect on the blood-picture of this treatment is shown

in the table. Its effect on the attacks of mesenteric thrombosis was not at all evident for they persisted as before, with one period of four weeks freedom from them in January, 1943. Treatment with heparin as an antithrombotic was suggested but domestic difficulties appeared to be a complete bar to the great elaboration required both to administer it and to control its effects.

On Feb. 5, 1943, he had a very severe attack of abdominal pain after a streptococcal pharyngitis. At this time there were signs of an intracranial thrombosis, retention of urine requiring catheterisation and also three weeks of priapism. For two days he appeared to be once more in articulo mortis, but he made his usual recovery, finishing with a bout of hæmorrhoids. Again in April, 1943, he was desperately ill with bilateral quinsies and remained in poor health until June. At this time his optimism and general cheerfulness seemed to desert him and he became very despondent. The administration of heparin still seemed impracticable, but an editorial in THE LANCET of May 15, 1943, drew our attention to dicoumarol as an agent in lowering the blood prothrombin, and its use was decided upon after a study of the literature. The preparation used was in the form of capsules, each containing 0·05 g. of the drug. On June 25, 1943, treatment was begun with a dose of 0·05 g. given on alternate days. The prothrombin indices before and during treatment were as follows:

Date	*Prothrombin index*	
June 25, 1943	92	Before treatment with dicoumarol.
Aug. 8, 1943	70	Continuous treatment with dicoumarol.
Aug. 28, 1943	62	
Sept. 14, 1943	50	
Nov. 27, 1943	60	

This treatment is, of course, vastly simpler than the elaborate methods and control of heparinisation. He walked a mile on June 25 for the first time since February, 1942. On July 2 he had an attack of abdominal pain so mild that he ignored it. The next was after an interval of 10 weeks, on Sept. 15, when he had a moderate pain from 1.20 PM to 10 PM and spent a day in bed. One unusual feature of this attack was a slight rigidity of the left rectus abdominis, all previous attacks having shown varying degrees of rigidity of the right rectus. Since the beginning of July, 1943, he has recovered his cheerful outlook and general vivacity. His attacks of pain are infrequent and mild. In January, 1944, he was comparatively well, but in February fell victim to a long attack of pharyngitis and tracheitis. He recovered by the end of March, since when he has enjoyed remarkably active good health, and abdominal pain has been completely absent for 3 months.

It will be noticed that while the prothrombin content is diminished and the evidence of thrombosis less under the present treatment, the lymphocytic series are again greatly increasing. This increase has been unaccompanied by any clinical deterioration, and for the present it is not intended to treat the leukæmia by radiation. During treatment there has been no suggestion of hæmorrhage in any part of the body.

SUMMARY

A case of chronic lymphatic leukæmia was complicated by recurrent thrombotic phenomena culminating in acute intestinal obstruction. Its basic treatment by radiation and the treatment of its complicating factor of thrombosis with dicoumarol are described.

SIGNIFICANCE OF BLOOD HISTAMINASE IN PREGNANCY

A. AHLMARK

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SINCE Marcou and Athanasiu-Vergu (1937) demonstrated a histamine-inactivating substance in the blood of pregnant women, several authors have studied this phenomenon.

Zeller and Birkhäuser (1940) described a gasometric method by which a significant increase of the histamine-destroying effect of blood could be observed from about the 13th week of pregnancy. Werle and Effkemann (1940) devised a biological method by which it was possible, as early as the 3rd month, to show a histamine-destroying effect 3½ times the normal. Zeller's qualitative method, founded on the decolorising of indigo disulphonate by H_2O_2 formed when histamine is destroyed, has been used by, among others, Neumann and Ebbinge (1942). The histamine-inactivating principle tallies in important respects with histaminase as originally described by Best and McHenry (1930) or diaminoxidase (Zeller).

Hitherto, however, there has been no accurate means of quantitative estimation of the enzyme throughout pregnancy; nor have we any definite knowledge of the physiological variations of histaminase in the pregnant organism. I therefore thought it desirable to work out a method of determining the amount of histaminase in the blood and to investigate the enzyme in normal pregnancy.

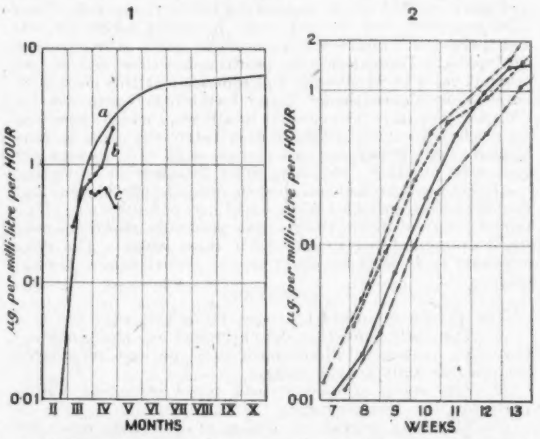

Fig. 1—Blood histaminase in pregnancy.—Histaminolytic power, expressed by the amount of histamine destroyed by 1 ml. plasma in one hour, charted against months of pregnancy. (a) = normal pregnancy (mean of about 110 blood-histaminase determinations). (b) = imminent abortion at the beginning of the 4th month. The uterine bleeding stopped after about 2 weeks. (c) = uterine bleeding in the 3rd and 4th months. The day after the last histaminase determination the patient was operated on for extrauterine pregnancy.

Fig. 2—Blood histaminase in four healthy women from 7th to 13th week of pregnancy.

Briefly, the histaminase content is determined by repeated tests in plasma to which the amine has been added, and which is incubated at 37° C. The histamine is determined by comparing the effect of chemically treated plasma with the effect of a standard solution of histamine on isolated strips of the guineapig small intestine. The activity of the histaminase is expressed by the amount of histamine dihydrochloride destroyed by 1 ml. plasma in one hour at 37°, the initial histamine dihydrochloride concentration being 1·0 to 2·5 microgrammes per ml. By adding varying amounts of the enzyme to plasma, by mixing enzyme solutions of different concentrations, and in other ways, it has been proved that this unit gives a sufficiently accurate estimate of the histaminolytic power of the human plasma (from about 0·005 to about 12 μg/ml. per hour).

Investigations of the histaminase content of blood, carried out by this method, show a destruction of less than 0·02 μg/ml. per hour—as a rule less than 0·01 μg/ml. per hour—in the case of non-pregnant women. During pregnancy, however, a considerable increase of enzyme activity is observed from about the 7th week after the last menstruation. As shown in fig. 1, enzyme activity increases very rapidly; already after one month it is about 100 times greater. The increase is so great that during this period it is possible to demonstrate an increase from one day to another. Fig. 2 shows that in different women the increase is remarkably constant. During the later part of pregnancy the enzyme activity attains about 500–1000 times the normal, varying somewhat from one woman to another.

In certain pathological conditions during pregnancy the enzyme behaves characteristically. When abortion is imminent the increase in the histaminolytic power of the blood is less rapid, and the degree of inhibition may be an aid to prognosis. The slower the increase, the greater is the probability of abortion; but a rise continuing during a uterine hæmorrhage is favourable. In

fig. 1 two typical cases are recorded. With slight albuminuria due to pregnancy toxæmia there is an increase of histaminase, and in hydatiform mole there are characteristic values. The highest reading I have yet found—showing a destruction of more than 15 μg/ml. per hour—was in a case of premature parturition at the beginning of the 8th month.

As shown by earlier investigations, the human placenta contains a considerable amount of histaminase. Animals with a high histaminolytic power in the placenta (guineapigs and rats) show, like man, an increased blood histaminase during pregnancy, whereas cats and rabbits, having low placental histaminase, do not. Experiments with rats also show a correlation between the histaminase in the placenta and in the blood. We know that in certain animals histamine has a contracting effect on the uterus (less pronounced during pregnancy), and thus the above observations throw interesting light on the physiology of the placenta. They also make it clear that blood histaminase is an indicator of placental histaminase. The correlation between placental histaminase and strength of labour, demonstrated by Danforth (1939), could thus be confirmed by the study of blood histaminase. In this way our knowledge of the effect of changes in histamine-histaminase metabolism on labour might be widened.

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ACUTE DIFFUSE PERITONITIS TREATED WITH SULPHATHIAZOLE SUSPENSION

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A SERIES of 789 consecutive cases of acute appendicitis treated by me included 95 with acute diffuse peritonitis. In all of these the general treatment was the same:

Operation was immediate except in cases showing much dehydration, when not more than two hours' delay was allowed. Gastric retention was treated by lavage; and suction through an in-lying duodenal tube was continued well into the postoperative period if vomiting persisted. The routine anæsthetic was open ether, though local and spinal anæsthesia were occasionally employed. Appendicectomy was performed in all patients except one man of 68 who was treated by drainage only, with eventual recovery. The incision was as nearly as practicable over the area of maximum tenderness. Drainage was used if hæmostasis was doubtful, if there was the possibility of a fæcolith or necrotic tissue being left behind, or if the bowel wall showed areas of inflammation which might lead to fistula formation. Free pus was aspirated as far as possible before closure of the abdomen.

In 75 cases no sulphonamide drug was administered. In the other 20 a sulphathiazole suspension * was introduced into the peritoneal cavity. These 20 would have been consecutive but in one case the drug was not available at operation. (This patient recovered.) The mortality-rates are shown in table I.

TABLE I—MORTALITY-RATES

Treatment	Cases	Deaths	Mortality
Without sulphathiazole suspension	75	15	20%
With sulphathiazole suspension ..	20	1	5%
Total	95	16	16·8%

The cases treated with sulphathiazole suspension are summarised in table II.

Instillation of the suspension adds a few minutes to the operative time, for 9 grammes contained in 60 c.cm. has to be placed slowly into the wound and well away from any drainage-tube. Provided the suspension has been kept airtight, there is no difficulty in handling it; experience of its use in thoracoplasty incisions suggests that there is no tendency to "caking," and there was no evidence of caking in the one abdomen which was reopened on the 128th postoperative day. (This patient was also the only one given any oral sulphonamide, and that was some three months after the first operation.) No reactions attributable to the drug were noted.

The impression I have gained from this small series is that intraperitoneal sulphathiazole is probably of value in the treatment of diffuse peritonitis, though it must be realised that some of the bacteria commonly causing this condition are sulphonamide-resistant.

I wish to thank the Medical Research Council for arranging the supply of sulphathiazole suspension (sterilised) by Messrs. Menley and James; also Dr. J. Rennie, medical officer of health, and Dr. J. Clark, medical superintendent, for permission to publish these results. Especial thanks are also due to Prof. Wilson Smith and Dr. H. E. Harding for their reports in bacteriology and histology respectively.

TABLE II—CASES TREATED WITH SULPHATHIAZOLE SUSPENSION

Sex and age	Ill before operation	Operation and duration (min.)	Sulphathiazole (g.)	Complications	Culture	Days in hospital
M 56	48 hr.	A & D (20)	9	Lobar pneum. RLL	*B. proteus, B. coli, Strep. fæc.*	24
F 7	48 hr.	A & D (12)	4·5	..	*B. coli, Strep. fæc., Staph. albus*	Died 8 hours later
M 8	24 hr.	A (12)	4·5	..	Many pus cells Culture: nil	17
M 13	18 hr.	A (15) (broncho-pneum., RLL)	9	Intest. obstruct. 128th post-op. day	*B. coli*	173
M 20	6 days	A & D (20)	9	..	*B. coli, Strep. fæc.*	37
M 31	4½ hr.	A (20)	9	..	No report	13
M 21	4 days	A (30)	9	..	*B. coli*, bacill. Friedlander group	13
F 44	4 days	A (20)	9	Severe ileus	*B. coli*	37
M 17	4 days	A (15)	9	..	*B. coli*	11
M 44	19 hr.	A (15)	9	..	*B. coli*	14
M 6	2 days	A (10)	9	..	*B. coli*	13
M 61	40 hr.	A & D (25)	9	Severe ileus	*B. coli*, pneumococci	31
F 30	45 hr.	A (17)	9	..	*Staph. albus*	12
M 22	24 hr.	A (20)	9	..	*B. fæc. alk.*	12
F 25	30 hr.	A (20)	9	..	*B. coli*	14
M 53	18 hr.	A (16)	9	..	*B. coli*	21
M 15	18 hr.	A (15)	9	..	*B. coli, Strep. fæc.*	19
F 8½	48 hr.	A (15)	6	Mild ileus	*B. coli*	34
M 44	30 hr.	A (15)	9	..	*B. coli*	12
M 2	36 hr.	A (15)	3	..	*B. pyocyaneus, B. coli*	14

A. = appendicectomy; D = drainage.

In all but one case (in which the appendix was gangrenous) the appendicitis was proved by microscopical examination.

* An aqueous microcrystalline suspension containing 15% sulphathiazole made isotonic with sodium chloride (Menley and James Ltd.).

New Inventions

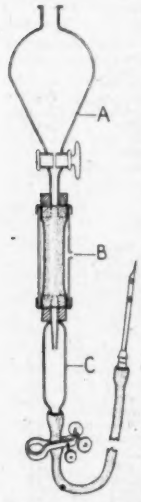
INTERMITTENT PENICILLIN DRIP APPARATUS

THE advantages of the continuous intramuscular drip method of administering penicillin have recently been established. The original method of giving 100,000 units in 540 c.cm. daily caused water-logging of the leg, resulting in irregularity of flow of the drip. If smaller volumes such as 100 c.cm. are used it is difficult to control the flow at a sufficiently slow rate. The 'Eudrip' apparatus[1] attempts to overcome this problem by using a delicate though complicated control of the air intake to the apparatus, and thus delivers a small volume of solution continuously to the patient. The following apparatus differs from the above in that it is designed to administer a fixed small volume of penicillin solution, discontinuously over a stated period. It can be constructed from pieces of apparatus readily obtainable in a hospital laboratory and it is easily managed by the nursing staff.

The principle is simple. A reservoir delivers via a tap a fixed amount (10 c.cm.) of penicillin solution every 3 hours into a distensible container, which when fully expanded will hold only that quantity of solution. The

1. See McAdam, I. W. J., Duguid, J. P. and Challinor, S. W. *Lancet*, Sept. 9, 1944, p. 336.

outflow from the container is controlled by a dripper and screw clip leading through a length of rubber tubing to a large needle inserted subfascially into the anterolateral aspect of the thigh.



The apparatus assembled. A, glass reservoir; B, control unit; C, dripper.

The reservoir (A) is a pear-shaped separating funnel (150 c.cm. capacity) with a glass tap and short outlet tube. This tube is inserted into one end of the control unit (B) consisting of a 3 in. length of ¼ in. bore glass tubing with a side blow-hole. The glass tube contains throughout its length a piece of 1 in. thin Paul's rubber tubing held firmly in position by well-fitting perforated rubber bungs. A standard MRC blood dripper (C) is inserted into the lower end of the control unit. This leads through 6 feet of ¼ in. bore rubber tubing to a large stainless steel aspirating needle with lateral openings. The apparatus is not more than 12 in. long exclusive of the rubber tubing.

Standardisation should be done in the laboratory before use. The apparatus can be hung by tape from the ordinary intravenous drip stand and should be about 4 feet above the level of the needle. The reservoir is partly filled with water and after opening the glass tap air is driven from the Paul's tubing by blowing through the blow hole with a small piece of rubber tubing held in the mouth. The Paul's tubing will then fill with water completely. The screw clip should then be opened and the needle elevated to allow the air to escape from the rubber tubing, after which the screw clip is closed. Next close the glass tap and open the screw clip; this empties the control unit. A measuring cylinder into which the needle is inserted will record the amount delivered, usually over 10 c.cm. Rotate the rubber bungs on the control unit in opposite directions. This will kink the Paul's tubing slightly and diminish its capacity when full. By this means the apparatus can be made to deliver 10 c.cm. accurately. After standardisation the apparatus should be wrapped in kraft brown paper and autoclaved.

The assembly for use on the patient is similar to that described above, except that the apparatus should be "started" with 20 c.cm. of sterile saline. The daily dose of penicillin—e.g., 100,000 units—is dissolved in 80 c.cm. of distilled water and placed in the reservoir, the inlet of which is plugged with sterile wool. A stainless steel needle should be used, for other types tend to oxidise in the tissues. A large bore, 12 BWG, with four lateral holes drilled with a medium dental burr, favours an easy exit of the solution into the tissues, and introduction is painless if procaine is injected before insertion. The control unit is filled from the reservoir every 3 hours by the nurse. The control chamber empties via the dripper during the following 3-hour period, taking about ½ to 1 hour, but pressure changes in the leg may cause this rate to vary slightly.

The apparatus has been used in a large number of cases with success. Estimations of penicillin concentration in the blood have shown a satisfactory level of bacteriostasis both before and after the 3-hourly dose.

I wish to thank Prof. T. B. Davie and Dr. C. V. Harrison of the Department of Pathology, Liverpool, for their help in the preparation of this paper.

G. V. OSBORNE, MB LPOOL
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Reviews of Books

Symptomatic Diagnosis and Treatment of Gynæcological Disorders

MARGARET MOORE WHITE, MD LOND., FRCS, MRCOG, surgeon-specialist, Three Counties Emergency Hospital, Arlesey, Beds; late first assistant gynæcologist, Royal Free Hospital, London. (Lewis. Pp. 230. 16s.)

Miss Moore White's book, mainly intended for the general practitioner, discusses the common symptoms and signs met with in gynæcological practice, and their treatment. Pruritus vulvæ usefully receives a chapter to itself; a note of warning might have been added about the danger of carcinoma in leucoplakia vulvæ, and hence the potential dangers of X-ray therapy, and possibly of treatment with œstrogenic hormones, in this condition. The chapter on vaginal discharges is marred by some trifling slips. Miss White has little new to offer on the treatment of dysmenorrhœa—who has ?—but she summarises existing methods well and assesses their relative value. The chapter on amenorrhœa is helpful; but though no doubt the ideal scientific basis for the treatment of ovarian dysfunction is endometrial biopsy or urinary hormone estimation, it seems to be asking much from the busy practitioner. The lucid chapter on sterility was to be expected from the author; it sets out well the essential points in modern methods of diagnosis and treatment. Other chapters deal with distressing antenatal symptoms, urinary frequency, prolapse and dyspareunia, and Miss White does much to clarify our views on pelvic pain and backache. The book ends with chapters on contraception, by Dr. M. Redding, and radiation therapy in gynæcology, by Mr. I. G. Williams. An appendix gives the hormone content and dosage of many proprietary preparations in common use. Based on the author's wide clinical experience, and full of practical advice, the book is welcome.

The Partially Seeing Child

WINIFRED HATHAWAY. (Oxfd Univ. Press. Pp. 216. 16s. 6d.)

THIS book is well illustrated and gives a good account of the education and health of the partially sighted child in the USA. Although special classes are still too few, a sound system of education has been established, both for town and country children. The partially sighted are not segregated from normal children, but join with them in suitable lessons. In addition they receive a good deal of individual attention in special classes held in properly lighted and well-furnished classrooms. Reading is regarded as essential to learning, but it is still difficult to obtain a sufficient number of large-type books. Oral tuition is assisted by the use of the dictaphone and radio, while the typewriter is a valuable sight-saving device for higher grade pupils. The book gives practical information about the educational and health services, the methods of teaching, and the training of special teachers. An outline of the anatomy and diseases of the eye is included, which should assist teachers to understand the visual capacities of the children. A little more information about their ultimate vocations would have been useful.

Medical Physics

Editor-in-Chief: OTTO GLASSER, PH D, head of the department of biophysics, Cleveland Clinic Foundation. (Year Book Publishers; Lewis. Pp. 1744. £5 13s. 6d.)

THE title of this book might well have been "applications of physics in medicine." The 1744 pages are contributed by over 200 different writers, and the field covered is wide enough for even the most physically-minded. For many doctors it will prove rather too wide. The headings of anatomy, bacteriology, dermatology, medicine, neurology and pathology are not signposts to the subject itself but merely convenient subsections for the description of physics in medicine. Examples will explain the general plan though hardly the scope of the work: under the section "Anatomy" is found the application of physics in electron microscopes and photomicrography. Under "Hæmatology" are the physical principles of circulation, and diffraction methods of measuring small objects. "Pathology" includes articles on centrifugation, cinephotomicrography and fluorescence-microscopy. There seems to be some application of physics in every part of medicine whether in ward, operating-theatre or laboratory. The articles are of high level and show the many ways in which the physicist can play a useful part in medicine. As a reference book, the first of its kind, it should receive a wide welcome.

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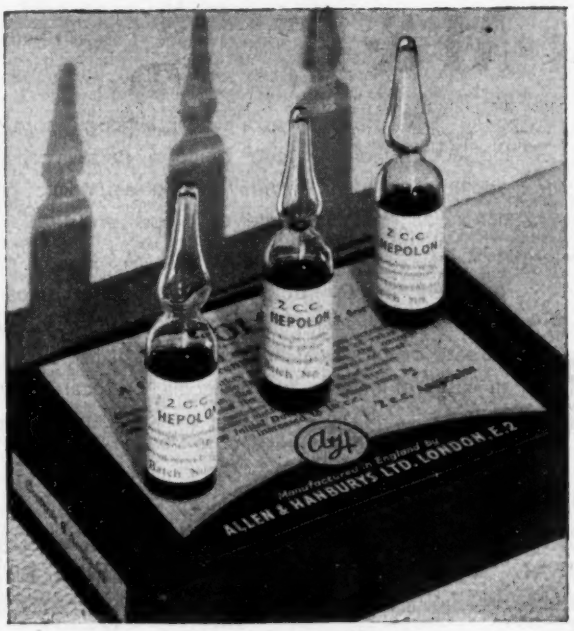

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THE LANCET

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Skin Cover

SKIN has more important functions than to delight the artist and the lover and offer a palette to Elizabeth Arden. It is the chief agent in regulating temperature. It is the one tissue that can stand up to mechanical, thermal and chemical trauma without suffering more than local damage quickly repaired. It is the Siegfried line between the systems of the body and the outside world; when it is breached, microbial invaders can enter, and must then be cast out by troops summoned from afar, and kept out by repair of the wall. A wound is a breach of continuity in the skin, with or without involvement of underlying tissues, and healing of the wound means a re-covering of the breach. A healed wound is a scar, a zone where the normal skin texture is replaced by undifferentiated epithelium and the underlying structures by fibrous tissue. The broader the scar, the greater the amount of fibrous tissue in its deeper parts, the more will it interfere with function. A broad scar, typical of any lacerated wound that has healed unaided, is covered by a thin layer of discoloured and unsightly epithelium which has no fat under it and is therefore adherent to any deeper structure that was implicated in the original wound. Such a scar is liable to break down with slight external trauma, or even with the trauma of movement of the part; it interferes with the action of joints or muscles beneath it; and, if adherent to nerves, it is painful.

Healing has always been the primary concern of surgery, first the healing of accidental wounds, later of surgical incisions. Because the fight against infection has been a long one and the victory only recent, the way to accelerated healing in traumatic surgery has traditionally been sought in overcoming the bacteria and assisting the processes of natural repair. Delayed primary suture and secondary suture of soft-tissue wounds was practised by many surgeons in the last war, with results that have hardly been exceeded in this; but the fear of infection remained dominant, and during the first two years of the present conflict the advantages of earlier healing were lost sight of in the search for safer healing, which the closed-plaster method seemed to assure. Only with the advent of bacteriostatic agents that abolished or aborted the primary pyogenic infection of wounds and made suture safe even in the presence of bacteria has the surgical closure of war wounds come into its own again, and found wider and earlier application. The Directorates in Middle East and North Africa have for some time urged the need to epithelialise all wounds at the earliest opportunity. Three papers and a War Office memo have lately appeared preaching the same gospel. MACPHERSON in our issue of July 8, and SARJEANT and MORTON on Sept. 9, dealt with the early closure of soft-tissue wounds in general hospitals. The latter urged particularly the importance of little wounds which, with suture, should be healed in 7–10 days, but without suture may take several weeks to heal. CLARKSON, in this issue, is chiefly concerned with the late wounds and larger defects that are sent to a plastic unit for repair. He brings out the important points, by no means sufficiently known, that the great majority even of these large defects can be closed by the use of local tissues, and that earlier and sounder healing is obtained by this means, where the scar is covered by subcutaneous tissue as well as by skin, than by the use of free grafts. The War Office *Memo on Skin Cover for Wounds and Burns* re-emphasises the dangers of primary closure of wounds caused by missiles, but urges the early secondary closure of all defects. It points out that the simpler methods of closure can be carried out by all surgeons and some of the more straightforward methods of flap transference by experienced general surgeons, and it gives illustrations of useful flaps; at the same time it enumerates the types of case which should be referred to a plastic centre.

In recent months, particularly since penicillin has been freely available, there has been a tendency to suture simple wounds earlier, from 3 to 6 days after wounding, particularly where the primary excision of the wound has been well done. At this early date little beyond cleansing and suture is needed; in late wounds the skin edges must be pared and undercut, and the whole repair zone must be excised. Surgeons vary in the importance they attach to the number and nature of the bacteria in a wound. SARJEANT and MORTON express the views of the majority when they say that the important thing is not the type of organism but the degree of infection, and advise that the decision to suture should depend on the clinical appearances of the wound and its surroundings. The cutting of free skin-grafts is an art that must be learned, but many surgeons can now cut one the size of the palm of the hand. For those attempting larger grafts the Humby razor and the Padgett dermatome[1] have made things easy. Last week, SHEEHAN described the technique of cutting grafts to a pattern, sticking them to a square of rubberised tulle, and making them adhere to the raw area by painting graft with a suspension of leucocytes and recipient area with plasma, a method devised by SANO.[2] Small grafts are particularly useful on septic areas and unhealthy granulations, but pinch grafts, which leave an unsightly mottling in the donor site and grafted area, are universally condemned. Split skin grafts cut into small patches, often referred to as postage-stamp grafts, have the merits and none of the defects of the Reverdin.

The value of early wound closure is not however limited to those flesh wounds of moderate severity in which, by giving a thin mobile scar, it improves function and allows earlier return to duty. In more severe injuries that will require a planned reconstruction later an operation to secure epithelialisation allows the major procedure to be done in a sterile field at an earlier date. Definitive amputations, bone-grafts, nerve-sutures, and operations for the repair of facial deformities, need such favourable conditions. Secondary suture of the soft parts in compound fractures, when it is possible, will save months of invalidism and prevent that chronic recurring osteomyelitis which is a common sequel of the bone injuries of warfare. The case for early skin cover is put succinctly in the War Office memo:

1. See *Lancet*, 1943, 1, 532. 2. *Ibid*, 1944, 1, 189.

"Pus is not a good wound dressing. Epithelium is better than any antiseptic, and closure by skin cover is the quickest way of sterilising a wound."

Remedies for Kala-azar

LIKE most other diseases, kala-azar is complex, but its course has become clearer with closer study. Before its cause and transmission were understood, it had been recognised in India as a "place" disease, whose slow, fatal epidemics could often be ended by moving for a short distance the infected inhabitants of coolie lines. With the discovery of the Leishman-Donovan bodies it was natural, in India especially, to postulate an insect vector, and a study of geographical distribution and of insect fauna led to the suspicion that the close correlation between kala-azar and the presence of *Phlebotomus argentipes* was more than fortuitous. Despite great efforts, however, it was long before this suspicion could be confirmed. The sandflies were delicate and difficult to maintain; the incubation period was long; and attempts to infect hamsters by bite gave poor results until SMITH, HALDER and AHMED [1] demonstrated that, after the infecting feed, the sandflies should be fed on fruit juices (raisins) and not on blood, if they were to develop the "blocked" condition—similar to that of fleas with the bacillus of plague—necessary for transmission by bite. Then definite proof of transmission, to animals and to man,[2] was forthcoming; the crucial experiments were positive.

But prevention was difficult. Sandflies breed in broken masonry and heaps of rubbish, ubiquitous in the tropics. They penetrate mosquito nets, and though they do not usually bite at a height of more than 10 or 12 feet above ground, to urge the peoples of endemic areas to build two-story houses and sleep upstairs is thought to be something of a counsel of perfection. WHITTINGHAM [3] could keep his Royal Air Force sleeping quarters free from sandflies by an ingenious arrangement of electric fans, but in Indian and in Sudanese villages this could hardly be repeated. Dogs are held to be reservoirs of kala-azar in the Mediterranean and China, but eradication of dogs throughout the affected regions of the world is hardly practicable. Treatment, therefore, seemed to be the chief preventive measure, and in any case was studied for its own sake. Antimony was known to be useful, the pentavalent compounds especially, and with 'Neostibosan,' 'Solustibosan' and 'Urea Stibamine' a high proportion of cures could be obtained in India, though in the Sudan the results were disappointing.

At this point is seen one of those convergences of scientific inquiry that do much to justify pure research. The story has been told before. The experiments of v. JANCSÓ [4] on the respiration and carbohydrate metabolism of trypanosomes led to the discovery that 'Synthalin' was trypanocidal, in vitro and in vivo, in high dilution, and to the view that its action depended on its power to interfere with glucose metabolism. The late Professor WARRINGTON YORKE and his colleagues [5] confirmed the fact but disproved the theory. Synthalin does indeed produce hypoglycæmia in animals; but hypoglycæmia sufficient to kill trypanosomes would also kill the host; moreover, insulin had no such action. Nevertheless YORKE appreciated the need for further investigation, and devoted his thought to it. Many compounds were prepared by KING,[6] which were related to synthalin, and were totally different from the recognised classical trypanocides; some of these were strongly active, and the results led to still further development of chemotherapeutic research by EWINS.[7] Through these combined and painstaking experiments the highly effective compounds stilbamidine, propamidine and pentamidine were added to the clinician's store.

Action on one protozoon led to tests on others, and the drugs were found effective against *Leishmania donovani*; tests in human kala-azar in India confirmed their value in practice, and it was established by NAPIER [8] and other workers that an alternative treatment of high merit was at hand. The same was true for African trypanosomiasis. Even in the Sudan, where kala-azar is so intractable, the results achieved by KIRK and SATI [9] indicated an action considerably greater than had been known with the antimonials, though the effect still lagged behind that achieved in India. More recently COLE [10] has reported a series of 60 cases of kala-azar from the Sudan. Some were treated with tartar-emetic, some with 'Anthiomaline,' some with urea stibamine and some with stilbamidine. The best results were obtained with urea stibamine, and this COLE regards as the drug of choice, though he admits that the relatively disappointing effect of stilbamidine may have been due to inadequate dosage or inadequate intensity. Urea stibamine he says is apparently innocuous, whereas stilbamidine sometimes has unpleasant immediate effects, especially a fall in blood-pressure.

There the matter stands. Other members of the diamidine series are being examined, and progress is not unlikely. Kala-azar is a slow, chronic disease, and evaluation of results needs the passage of years. But the development of its treatment is an example of the imaginative thinking of which WARRINGTON YORKE was capable.

Technique of Lumbar Puncture

THERE is need for better teaching of the minutiæ of lumbar puncture. Most beginners, without much practical instruction, can perform the little operation after a fashion, but even experienced operators commonly fall into error through faulty technique, producing needless distress to the patient, a blood-stained fluid relatively worthless for diagnosis, or avoidable trauma to the surrounding parts. There have been suggestions indeed that lumbar puncture can cause herniation of the nucleus pulposus. That the needle does sometimes penetrate the intervertebral disc is demonstrated by CARNEGIE DICKSON'S report [11] of cartilage cells in specimens of fluid sent for examination; he also found myelocytes and nucleated red cells from the bone-marrow, due to penetration of the vertebral bodies. Damage to the intervertebral

1. Smith, R. O. A., Halder, K. C., Ahmed, I. *Indian J. med. Res.* 1940, **28**, 575, 581, and 585.
2. Swaminathan, M. *Ibid*, 1942, **30**, 473.
3. Whittingham, H. E. *Trans. R. Soc. trop. Med. Hyg.* 1923, **17**, 290.
4. v. Jancsó, N., v. Jancsó, H. *Z. ImmunForsch.* 1935, **86**, 1.
5. Lourie, E. M., Yorke, W. *Ann. trop. Med. Parasitol.* 1937, **31**, 435.
6. King, H., Lourie, E. M., Yorke, W. *Lancet*, 1937, ii, 1360.
7. Ewins, A. J. *Trans. R. Soc. trop. Med. Hyg.* 1940, **33**, 464.
8. Napier, L. E. *Ind. med. Gaz.* 1942, **77**, 321.
9. Kirk, R., Sati, M. H. *Ann. trop. Med. Parasitol.* 1943, **37**, 34.
10. Cole, A. C. E. *Trans. R. Soc. trop. Med. Hyg.* 1944, **37**, 409.
11. Carnegie Dickson, W. E. *Postgraduate med. J.* 1944, **20**, 69.

discs almost certainly accounted for the back pain following lumbar puncture in 35 cases of meningitis reported by BILLINGTON.[12] MUNRO and HARDING,[13] at the Boston City Hospital, made an X-ray study of needles in position for two-needle myelography. Flexion of the spine was not adopted in these patients, for MUNRO holds that this position does not secure more room for the needle between the adjoining bones. Of 50 needles studied, 36 were in such a position that if they had been pushed an average distance of 4–5 mm. further in the same line they would have penetrated the annulus fibrosus—one needle was within 2 mm. of it. Another example of avoidable trauma is damage to the roots of the cauda equina, an accident that may happen when persistent but incautious efforts are made to strike fluid in difficult cases, particularly when an unnecessarily large needle is used; it may leave a permanent dropped foot. The most serious accident of lumbar puncture is the introduction of infection, leading to septic meningitis. Wet sterilisation of the needle is often to blame.

The technique, then, must be thoroughly learnt and as carefully followed. The needle should be chosen for the particular job. For unanæsthetised patients likely to make sudden jerks, such as those with purulent meningitis, a nickel needle is best, because it will bend rather than break. For quiet patients a steel needle is preferable because it can be made sharper and used in finer sizes. It should be of suitable length, 2 in. for infants, 3½ in. for stout adults, and of suitable diameter, gauge 20 in steel for general use, gauge 22 in steel for infants, gauge 17 or 18 in nickel for violent cases. For outpatients the Dattner needle is ideal. It consists of an extremely fine inner needle carried in a larger one. The outer penetrates as far as the deep aspect of the ligamentum subflavum, whence the fine needle is pushed forward to make a minute puncture of the theca. Needle points should be sharpened frequently and their sharpness checked with a lens before use. Both needle and manometer should be dry-sterilised. The operator should have a clear idea of the approximate depth at which fluid will be struck; this varies from ⅜ in. in a small infant to over 3 in. in some adults. The passage of the needle should be under perfect control at every stage, the operator's hand being steadied by pressure on the patient's body. The patient should lie on a solid table rather than a bed, with the plane of the back exactly vertical, and most operators employ the fully flexed position. Strict asepsis is required, but face-mask and gloves are not essential provided the operator does not allow his fingers to stray over any part of the needle shaft which may penetrate the skin. The operator should be seated. The third lumbar space, which lies at the level of the iliac crests, or the fourth, is usually employed. In difficult cases the sitting position is sometimes successful, but it cannot be used when the fluid pressure has to be measured. The local anæsthetic is injected only intradermally and subcutaneously, or as far as the interspinous ligament when a gauge 20 or finer needle is used.

The skin is pierced with the sharpened point by rolling the butt of the needle between finger and thumb. The needle is inserted exactly in the midline, in a plane exactly at right angles to the plane of the back, and with a slant towards the head corresponding to the slope of the vertebral spines. It should be felt to pass through the interspinous ligament and down to the level of the root of the adjacent vertebral spines. Here it may encounter bony obstruction, and at this point the assistant forcibly draws up the patient's knees as near as possible to his chin, thus opening the "gate" between the vertebral rings. The needle should now be felt to pass through the ligamentum subflavum. From this point until fluid is struck the stilette should be removed every two millimetres. The practised operator will usually be able to feel the puncture of the dura and sometimes, immediately thereafter, of the arachnoid. REID [14] and CARNEGIE DICKSON [11] advise inserting the needle with the bevel edge in the spinal axis so that as it pierces the dura it merely separates and does not cut across the main fibres, which run longitudinally. The small opening thus caused closes again as soon as the needle is withdrawn, whereas when the bevel cuts across the longitudinal fibres a small hole is made through which fluid continues to escape, causing low-pressure headache. On no account must the needle be pushed right through the theca to injure the anterior venous plexus, the commonest cause of a blood-stained fluid and one that is avoidable in a quiet patient. If the fluid is not obtained, although the needle appears to be in the correct position, it should be withdrawn to skin level, the position of the patient checked and a fresh start made. The pressure of the fluid cannot be estimated, except in extreme cases, by the rate at which it escapes from the end of the needle. The manometer must be attached to the needle before even 1 c.cm. of fluid has escaped, and, before taking a reading, the patient must be completely relaxed with head and legs extended slightly until he is quite comfortable and free from strain. If there is a possibility of an intracranial expanding lesion being present, remove only 1 c.cm. for estimation of cell, globulin and total protein contents; the other tests can wait. If the first few drops of fluid are blood-stained they should be discarded and a specimen collected as soon as the fluid runs clear. Except in cases of subarachnoid hæmorrhage, the blood in the fluid should never be greater than a few drops at the beginning of the flow. Any greater amount should be regarded as a sign that the operator's methods need revising. Almost the only contra-indication to lumbar puncture is skin sepsis in the lumbar region. Even in spinal epidural abscess lumbar puncture is permissible if insertion of the needle is stopped directly pus is encountered.

Ventricular puncture is sometimes indispensable, but it should be performed only by those who are thoroughly conversant with the minute anatomy of the parts. Cisternal puncture is fraught with danger from two sources—when the needle point lies in the cisterna magna the distance between it and the medulla oblongata is very small and the margin of safety exceedingly narrow; and abnormal blood-vessels in the path of the needle just inside the foramen magnum are too common and too dangerous to be ignored. REID [14] urges that all necessary information

12. Billington, R. W. *J. Amer. med. Ass.* 1924, **83**, 683. Cited by Munro and Harding.
13. Munro, D. and Harding, W. G. *Ibid*, 1942, **119**, 484.
14. Reid, W. L. *Med. J. Aust.* 1943, **1**, 311.

can be gathered from lumbar and ventricular puncture, and that, in view of its dangers, there is no essential use for cisternal puncture. There was a time, in the treatment of purulent meningitis by serum, when it was legitimate in some cases to run the risks of cisternal puncture. That time has passed, and most will now agree that, apart from encephalography, the indications for cisternal puncture are scanty.

Annotations

SURGICAL ASPECTS OF PARATROOPING

TRAINING in parachute descents is becoming safer, judging by the analysis of Lord and Coutts [1] in the USA. Their paper covers an experience of more than 250,000 jumps and the accident-rate had declined from 13 per 100 jumps in April, 1943, to less than 2 per 100 jumps in December, 1943. The preliminary hardening period has its special injuries. Rope-climbing, for example, produces partial ruptures of the right rectus abdominis which simulate appendicitis, and "tumbling" exercises produce acromioclavicular injuries. The great majority of accidents sustained during the parachute descent occur when the trainee lands. A modification in training which makes the parachutist land with his feet together, instead of 18 inches apart, has greatly diminished the characteristic and disabling ankle fractures, in which the posterior lip of the tibia is broken off, but has increased high fibular fractures. The latter are far simpler to treat, far quicker to heal, and so relatively painless that many are clinically "silent." Good training is thus making parachute accidents, when they do happen, less wasteful of valuable time. The fact that Lord and Coutts give only one paragraph to the accidents which happen as the jumper leaves the plane, and detail only one case, seems to indicate that the serious injuries produced by entanglement in the harness or suspension lines of an opening parachute have almost disappeared. Most of the papers which have so far appeared on parachute injuries have dealt with the risks of training. They have had the flavour one might expect of a paper on ski-ing accidents. What happens when the trainee paratroop becomes operational has seldom been mentioned. but it is clear that the risks of jumping on to a field staffed by first-aid men are different from those of a descent, perhaps at night, into enemy-occupied territory. Longland and Kessel [2] gave an extremely modest and all too short account of a parachute surgical team in action; they did not describe in much detail the cases on which they operated, but it seems likely that the wounds received were much the same as those of infantry fighting. Their paper does however make clear that the difficulties of the paratroop surgeon may mean that the paratroop must sometimes add an absence of treatment to his other risks. The surgeon, or his ingeniously compressed equipment, may fail to arrive intact. Those essentials of all surgical treatment, shelter and water, cannot be carried and must be found on the spot. The wounded cannot, at least in the early stages, be evacuated, and the scenes of military and surgical operations may suddenly coincide. "A battle was in progress in the neighbourhood of the building, but the fire did not materially affect the running of the dressing station, where 35 cases were operated on with two deaths." Such conditions do not encourage the keeping of records on which papers can be based, but this remark by Longland and Kessel shows that the paratroop will have treatment if courage and forethought can provide it.

1. Lord, C. D. and Coutts, J. W. *Bull. U.S. Army med. Dep.* July, 1944, p. 57.
2. Longland, C. J. and Kessel, L. *Lancet*, 1944, i, 381.

DICOUMAROL IN PRACTICE

DICOUMAROL is now being used fairly extensively in North America and Scandinavia for the prevention or treatment of thrombosis and embolism, but though it has acquired a name approved by the BP Commission there have so far been few reports from British users. The experiences recorded in this issue are fair examples of the results being obtained. Scott and Lissimore record the successful control of recurrent mesenteric thrombosis in lymphatic leukæmia; dicoumarol lowered the prothrombin in the blood in the expected manner and no difficulties arose. Crawford and Nassim, attempting to treat a case of retinal thrombosis, met irregular response to dicoumarol and troublesome hæmorrhages not fully controlled by blood-transfusion. This sort of antithesis is the theme running through the papers published elsewhere. In 1942, Townsend and Mills [1] noted two effects that were contrary to original reports; they obtained very variable responses, as measured by the percentage reduction of prothrombin in the blood, to the same dose of dicoumarol in different subjects, and they demonstrated that vitamin K can have a definite antagonistic effect. Davidson and MacDonald [2] have confirmed this antagonism, showing that vitamin K_1 oxide antagonises the action of dicoumarol, and they record that the dose of dicoumarol needed to produce a given fall in prothrombin varies greatly from patient to patient. Wasserman and Stats [3] also record well-marked individual variation in response to identical doses of dicoumarol, so much so that they could not fix a standard dosage, as others have done before; they report vascular thromboses and embolism even when dicoumarol had halved the prothrombin content of the blood, and their patients sometimes bled inconveniently; altogether they were not impressed. Douthwaite [4] has met with cases resistant to dicoumarol. Evans [5] used dicoumarol for 56 patients with thrombotic emergencies. He records the usual great variation in individual responses and 5 of his cases were quite unaffected by dicoumarol, 2 of these being resistant to heparin as well. There was one death from hæmorrhage in a patient who had had a sympathectomy for lower-limb thrombosis; bleeding took place into the wound, the abdominal wall and retroperitoneal tissues and six blood-transfusions failed to control it. Better results were obtained by Zucker,[6] who treated 18 cases without serious incident; one case had transient purpura and one microscopic hæmaturia. He found that the safest method of control was to plot the daily prothrombin-time and only decide to give the daily dose if the prothrombin-time was less than the preceding day's reading. He gave an initial dose of 300 mg., with 200 mg. next morning and then 200 mg. daily as required. Among Zucker's series were 2 successfully treated cases of cavernous sinus thrombosis.

Brambel and Loker [7] used dicoumarol for a different set of conditions—post-traumatic arteriosclerosis, and gangrene due to frostbite and diabetes. They were satisfied that the drug could prevent the extension of established gangrene, and they thought it had prevented gangrene developing in their traumatic cases. In their 11 cases, the prothrombin-time altered in the expected manner and they had no difficulties with hæmorrhage.

It is clear from these experiences that dicoumarol should be used only if proper laboratory facilities for control are available, and that we have more to learn about its action. The irregular results suggest that there must be other so far undetected factors controlling the final

1. Townsend, S. R. and Mills, E. S. *Canad. med. Ass. J.* 1942, **46**, 214.
2. Davidson, C. S. and MacDonald, H. *New Engl. J. Med.* 1943, **229**, 353.
3. Wasserman, L. R. and Stats, D. *Amer. J. med. Sci.* 1943, **206**, 466.
4. Douthwaite, A. H. *Guy's Hosp. Gaz.* 1944, **58**, 91.
5. Evans, J. A. *New Engl. J. Med.* 1944, **230**, 131.
6. Zucker, H. D. *J. Amer. med. Ass.* 1944, **124**, 217.
7. Brambel, C. E. and Loker, F. F. *Arch. Surg.* 1944, **48**, 1.

effect of dicoumarol. That these factors will be sought for, and that dicoumarol—or drugs with a similar action—will have a place in therapy is certain, for, as Pfeiffer and Sain [8] say in their review, these are the only agents by which we can hope to "remove the fear of horrible experiences associated with sudden deaths from vascular accidents caused by thrombosis and embolism, and prevent pain and suffering caused by postoperative thrombophlebitis." They also offer a hope of controlling thrombosis in the cavernous sinus and mesenteric vessels.

SICKNESS RECORDS IN INDUSTRY

ONE of the happier outcomes of the war has been the rejuvenation of the Industrial Health Research Board. It was a bold move to appoint the youngest of the Ministry of Labour's medical factory inspectors as secretary, but it has been abundantly justified. The latest report,[9] issued by the Board's sickness recording subcommittee, contains much useful information on the methods that factories should adopt if sickness records are to yield statistically valid results. Sicknesses are classified under 7 main headings—colds and influenza, diseases of the respiratory system, diseases of the digestive system, the rheumatism group, functional nervous diseases, accidents at place of work, and an unclassified group. It is pointed out that while the Ministry of Labour's suggestions for absentee records are valuable where individuals are concerned, they do not yield enough data to enable group analyses to be made. The suggestions appear admirable, but there is some danger that employers may look askance at one more set of records to be kept for each worker. While the Excess Profits Tax remains they may not object to employing additional clerical staff. But when costs are more closely related to profits, the Industrial Health Research Board may find itself driven to adopt some sampling method, rather than the census of sickness absenteeism proposed. However, where employers have decided to record sickness absenteeism the advantage of standardised technique is manifest. The methods proposed have been put to practical test by at least 5 large firms and have been found satisfactory.

CIGARETTES AND THE CARDIOVASCULAR SYSTEM

THERE is no doubt that smoking tobacco causes vasoconstriction, but opinions differ about the precise factor responsible. The effect has been attributed to the nicotine itself, the irritation of the smoke on the respiratory tract, and the deep breathing associated with inhaling. Some observers have reported that the vasoconstriction obtained on smoking at rest does not appear when the subject is walking about. Workers at the Mayo Clinic [10] have carefully investigated the effect of smoking, and also of intravenous nicotine, in six normal adults (4 male physicians and 2 female technicians) aged 22–41. The familiarity of the subjects with the experimental procedures involved should have minimised the errors introduced by emotion. The smoking of two "standard cigarettes" reduced the cutaneous temperature of both arms and legs, no matter whether the subject was at rest or ambulant; there was also an increase in blood-pressure, pulse-rate and basal metabolic rate, and constant changes were produced in the electrocardiogram consisting of a lowering of the T wave as well as the increased heart-rate. All these changes were reproduced by the intravenous infusion of nicotine, but not by intravenous saline. No change in cutaneous temperature was produced by puffing an unlighted cigarette for the period it usually took to smoke two cigarettes, nor was this, or any of the other changes, produced by smoking "corn silk" cigarettes, which were used as a control in all the experiments. Control experiments were also carried out with standard cigarette tobacco, using French ashless cigarette paper, and a "popular British cigarette filter holder"; with these the same effects were obtained as with standard cigarettes. Before smoking, the average basal systolic blood-pressure for 14 observations was 99 mm. Hg (range of 90–120), and diastolic 69 mm. Hg (range of 60–85). During the smoking of two cigarettes the average rise in systolic pressure was 19 mm. Hg (range of 10–35), and in the diastolic pressure 14 mm. Hg (range of 6–20). As a result of smoking two corn silk cigarettes the average rise was only 3 mm. Hg in the systolic and 4 mm. in the diastolic pressure. These figures are fairly comparable with those of Lampson,[11] who in healthy students found that smoking produced an average rise of 12–15 mm. Hg in the systolic pressure. This investigation seems to provide convincing evidence that the vasoconstrictive effect of smoking is a true bill and that it is due to the nicotine content of the tobacco. To what extent it may damage a healthy circulatory system we still do not know; for evidence on this we must await detailed and controlled clinical records covering a long enough period. The immediate application of the observations is in forbidding smoking to patients with peripheral vascular disease or arterial injuries. The man in his '40s with an early hypertension should give up, or at least curtail, his smoking, even though the Mayo Clinic workers found no correlation between the blood-pressure response to smoking and to the cold-pressor test. And there would be much to be said for banning cigarettes to the soldier with an arterial wound in whom smoking might produce a dangerous degree of arterial spasm.

FIELD PSYCHIATRY ON THE SCREEN

> "All these combatants knew they had become increasingly afraid. They did not need to deny their fear or convert it into somatic disorder because of the attitude of the military group (the soldier's public); fear was accepted as such by both comrades and officers, and regarded as something which did not have to be repressed or denied but treated." [12]

THIS observation on neurotic casualties from the Normandy beach-head might have been a comment on the message of a new film, produced by the Director of Army Kinema, on the treatment of psychiatric casualties in the field. This good documentary is intended for medical officers only—perhaps lest it should become undeservedly famous as the skrimshanker's guide. Private Wragge, his anxiety for his wife's health fretted by the absence of mail, lacking sleep and proper food, and subjected to six days of mortar and other fire, becomes, as his comrades say, bomb-happy—an odd phrase for this tearful wordless shaking. He is sent back to the medical officer at the RAP, who gives him fifteen grains of 'Medinal' washed down with sweet tea, and books him for a week at the Corps Exhaustion Centre. While they are all waiting for the ambulance the doctor gives an informal lecture on acute anxiety to his sergeant, whose beautiful innocence and insatiable thirst for knowledge make him the perfect stooge. The device serves well, however, to show us some other types of reaction—depression, confusion, hysterical coma. The importance of sedation is rubbed well in; indeed, the offer of two little pellets and a cup of tea to all comers begins at this point to assume the aspect of a mystic rite. At the exhaustion centre Wragge spends two days mainly in sleeping and eating, a couple more in mending his clothes and tinkering with his boots and buttons,

8. Pfeiffer, D. B. and Sain, F. D. *Surg. Gynec. Obstet.* 1944, **78**, *Int. Abstr. Surg.* 109.
9. The Recording of Sickness Absence in Industry (A Preliminary Report). Industrial Health Research Board. Report No. 85. Pp. 17. HM Stationery Office. 4*d*.
10. Roth, G. M., McDonald, J. B. and Sheard, C. *J. Amer. med. Ass.* 1944, **125**, 761.
11. Lampson, R. S. *Ibid*, 1935, **104**, 1963.
12. Anderson, C., Jeffrey, M. and Pai, M. N. *Lancet*, Aug. 12, p. 218.

and the last three in recollecting that he is still a soldier, with the help of the commanding officer and a fattish NCO, whose deplorable acting was offset by his pleasing design. A word from the MO to the subaltern, over a glass of beer, ensures Wragge a friendly reception on his return to his mates, and the film ends lightly with the colonel prescribing the two little pellets for the overworked doctor. The human sensible little document, besides setting out the routine treatment of acute anxiety, reminds us that we cannot afford to bandy about such words as "yellow" and "skrimshanker" in a world where anybody is liable to have his bluff called at a moment's notice.

SULPHONAMIDES, EGGS AND ENZYMES

THE many pharmacological studies which have now been made of the sulphonamides demonstrate the impressive variety of their actions—many of them undesirable in chemotherapy. One is of especial interest because a definite biochemical mechanism can be assigned to it. Some sulphonamides lower the carbon-dioxide-combining power of blood, and Mann and Keilin[1] ascribed this action to the inhibition of carbonic anhydrase, an enzyme present in animals' cells which catalyses the reaction $H_2CO_3 \rightleftharpoons CO_2 + H_2O$. Sulphanilamide (2–3 g. daily) can inhibit the enzyme sufficiently to interfere with the excretion of carbon dioxide from the lungs of normal men performing strenuous work, though its effects are not seen in subjects at rest.[2] A more striking effect, though not one of clinical concern, has now been observed to follow the sulphonamide inhibition of this enzyme. Some sulphonamides, when fed to domestic fowls, caused their eggs to be laid without shells. The hens were not otherwise affected. It had been suspected from the high concentration of carbonic anhydrase in tissues of the hen's oviduct that this enzyme functioned in the formation of the calcium carbonate of the shell. The experiments of Benesch, Barron and Mawson[3] prove that this function exists. That the sulphonamide acts by inhibiting carbonic anhydrase is confirmed by the specificity of the effect, which is limited to certain sulphonamides only; the compounds exhibiting it are not all antibacterial. The actions on purified carbonic anhydrase[1] and on egg-shell formation were shown only by sulphonamides with unsubstituted $-SO_2NH_2$ groups; not, that is to say, by sulphapyridine. Hens dosed with this compound yielded normal eggs. The effects on eggs and the enzyme are shown by compounds lacking the nuclear $-NH_2$ group which is necessary for the normal antibacterial action of the drugs; acetylsulphanilamide remains active in inhibiting carbonic anhydrase, though it does not inhibit bacteria. Inhibition of this enzyme cannot, therefore, be the mechanism of the normal antibacterial action of the sulphonamides, the metabolic basis for which remains obscure. Para-aminobenzoic acid is involved in reactions effected by the sulphonamides, but these reactions have not been specified, nor have the enzymes been isolated, as have those producing the secondary action of the drugs on carbonic anhydrase. Moreover, the drugs have other types of action on micro-organisms. Recent reports have shown that inhibition of the brucella-like organism *Bacterium tularense*[4] and of the spirochæte *Treponema recurrentis*[5] by sulphonamides differs from the main antibacterial effects of the drugs in not being antagonised by *p*-aminobenzoate. These actions also differ among themselves in the structural specificity of the compounds which produce them, and they may afford starting-points for new types of chemotherapeutic drugs.

1. Mann, T. and Keilin, D. *Nature, Lond.* 1940, **146**, 164.
2. Roughton, F. J. W., Dill, D. B., Darling, R. C., Graybiel, A., Knehr, C. A. and Talbott, J. H. *Amer. J. Physiol.* 1941, **135**, 77.
3. Benesch, R., Barron, N. S. and Mawson, C. A. *Nature, Lond.* 1944, **153**, 138.
4. Tamura, J. T. *J. Bact.* 1944, **47**, 529.
5. Hawking, F. *Brit. J. exp. Path.* 1944, **25**, 63.

PREVENTION OF AGRANULOCYTOSIS

AGRANULOCYTOSIS is a serious complication that must be watched for when any of the sulphonamide drugs are being used; it has now also emerged as a complication of the thiourea treatment of hyperthyroidism. Agranulocytosis may be fatal, so that any means of prevention is worth exploring. That the liver extracts made for the treatment of pernicious anæmia had some influence on agranulocytosis had been suggested from time to time, but the cases reported were few and assessment of the value of liver was difficult since other forms of treatment had too often been given as well; a further difficulty is that agranulocytosis can remit spontaneously. Experiments with rats have produced more concrete evidence. Sulphonamides were fed to rats together with a controlled diet; a granulocytopenia and some anæmia developed; it was shown that the addition of liver to the diet prevented the appearance of these blood changes. Axelrod and his colleagues,[1] who fed sulphaguanidine to their rats, identified the effective substance in the liver extracts as folic acid, a factor previously isolated from liver fractions; other likely factors, such as nicotinic acid, biotin, adenosine and other nucleotides had no effect. Now Goldsmith and others[2] have shown that granulocytopenia develops when thiourea is fed to rats, and this also can be prevented by adding liver to the diet; they suggest, but have not proved by direct experiment, that lack of folic acid is the operative factor in the disease; and they conclude that folic acid could usefully be given to patients receiving thiourea for the treatment of hyperthyroidism, in the hope of preventing agranulocytosis. This suggestion is interesting, but two points should be considered. In the first place, the worst and least recoverable cases of agranulocytosis are due to idiosyncrasy to the drugs used; they are of sudden onset and occur before a large dose of the sensitising drug has been given. These experiments on rats correspond to the toxic granulocytopenia that develops when the drug has been given for some time, and they provide no evidence that folic acid will control the idiosyncratic cases. Secondly, it is not known whether folic acid has any importance in human nutrition, but it cannot be taken for granted that the results of experiments like these are transferable to man; we can only try and see. Nevertheless the experiment is clearly worth making, especially in the treatment of hyperthyroidism with thiourea or thiouracil, since these substances are given over long periods. We hope that when the experiments with folic acid are planned they will be carried out scientifically by those who have the proper facilities, so that the answer is as clear as possible; this is no field for reporting half a dozen cases.

WE regret to record the death of Dr. LEWIS SMITH, consulting physician to the London Hospital, on Monday last.

IN view of the Government's request that meetings shall not be held in London, the Harveian oration of the Royal College of Physicians is to be delivered in Manchester this year. Sir EDMUND SPRIGGS, the orator, will speak at the Royal Infirmary there, on Wednesday, Oct. 18, at 3.45 PM, on the Harveian method in literature.

Prof. W. E. GYE, FRS, director of the Imperial Cancer Research Fund, is to deliver two lectures at the Royal College of Surgeons of England on Thursday, Oct. 5 and 12, at 4 PM. His subject is to be the part played by viruses in cancer causation.

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Special Articles

CALCULATION OF LUNG EXPANSION BY EXTERNAL MEASUREMENTS OF TRUNK

APPLICATION TO THE STUDY OF DYSPNŒA IN RECRUITS

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LIEUT.-COLONEL RAMC

VITAL capacity is the volume of air exhaled after the deepest possible inspiration, and is usually measured by some form of spirometer. Spirometers are widely used by chest physicians and surgeons and yield invaluable information, but the method is inconvenient for rapid testing of recruits, because the apparatus is not easily transported, skill is needed to get accurate results and several readings must be taken.

A method has been evolved for estimating the total expansion of the trunk (chest and abdomen) from the following measurements :

Circumference of chest at nipple.
" " " " xiphisternum.
" " " abdomen at umbilicus.
Distance from suprasternal notch to symphysis pubis.

From these one can calculate the increase in the total volume of the trunk, which is equal to the increase of volume of air in the lungs. For this calculation the following assumptions are made :

(1) The upper part of the chest is a cone, with its apex at the suprasternal notch, and a circular base at the level of the nipples. During inspiration its length increases, and so does the radius of the base. (2) The abdomen from umbilicus to symphysis pubis is a similar inverted cone. (3) The parts of the trunk from nipple level to xiphisternum, and from xiphisternum to umbilicus, are truncated cones which expand by increase of length and of the radii of their ends. (4) The lengths of each of the two cones and of the two truncated cones are all one-quarter of the total length of the trunk. (The measurement at the xiphisternum is in practice made half-way between nipple level and umbilicus.)

If a is the circumference of the chest at nipple level, b the circumference at the xiphisternum, c the circumference at the umbilicus, and L the length from the suprasternal notch to the symphysis pubis, then the volume of the trunk V equals

$$\frac{L}{48\pi} \cdot (2a^2 + 2b^2 + 2c^2 + ab + bc)$$

Three-figure tables have been constructed for the expression $\frac{L}{48\pi} \cdot 2x^2$ for all values of L over the range of adult trunk measurements (48 to 62 cm.) and all values of x over the range of abdomen and chest circumferences (62 to 110 cm.). From these, against any length L and circumference a, b or c, the volumes (in 10 c.cm.) of the first three terms of equations can be directly read. Another series of tables have been made for the expression $\frac{L}{48\pi} \cdot xy$ from which can be directly read the volumes of the last two terms of the equation (in 10 c.cm.).

METHOD

The measurements are made with a tape-measure in centimetres, the subject lying flat on his back, with the arms easily by his side. Several readings can quickly be taken of the circumference at each level, at full inspiration and full expiration.

Some men, on being asked to take a maximum breath, expand their chests very fully, at the same time retracting the abdomen, and the circumference of the abdomen thereby *decreases* with full inspiration. The explanation is that the subcostal angle is so much widened that the longer radius of the upper part of the abdomen increases its volume by more than enough to compensate for the movement of the diaphragm, which not only descends but is much flattened. Also, it is quite easy to take a maximum breath, and then, with the glottis closed, pull the abdominal wall in or push it out, whilst the volume of air in the lungs remains the same. This is described by Anthony (1938).

Another " unnatural " movement may be made : when the tape is round the abdomen, the subject may push out his abdomen with a deep breath, apparently " to show what he can do." But when the tape was round his chest, he expanded that fully and the abdomen moved little or was even retracted. This would give a false high value for the lung expansion ; but the error is very obvious when it occurs, and it can usually be overcome by instructing the man to take the deepest possible breath and forget about the tape on his chest or abdomen.

Of the three measurements, variations at the umbilical level have the least effect on the final result, a variation of 1 cm. giving a final error of about 0·45%.

It is always important to be sure that expiration is complete ; but there is rarely any difficulty about full inspiration.

Example.—Suppose the readings are :—

	Expiration	Inspiration
Nipple	86 cm.	94 cm.
Xiphisternum ..	79 "	86 "
Umbilicus	75 "	78 "
Length	51 "	54 "

In the tables one finds the values of the five terms of the equation, which added together give the trunk volume in expiration, and also the volume in inspiration. The readings (in 10 cm.) are :—

Expiration	Inspiration
501	633
424	531
382	438
201	289
175	240
16830	21310

The trunk expansion then = 21310 − 16830 = 4480 c.cm.

COMPARISON WITH SPIROMETER READINGS

Measurements were made on 51 students, in whom spirometer readings of vital capacity were also obtained. Fig. 1 shows that the calculated trunk expansion—which I term " lung expansion "—runs parallel and is a reasonably close approximation to the vital capacity over the range 3600 to 6500 c.cm. The explanation of the widely differing values found in a few cases is obscure.

The method, of course, can only provide an approximation, however close, to the vital capacity as measured by the spirometer. But it is an easy way of making comparable measurements, it serves the purpose for which it was required, and it is applicable to further work in the clinical field. The obvious fact that it is more accurate than a single reading of the increase of the chest circumference is shown by the wide ranges of lung expansions found with various single readings of the chest expansion at nipple level as usually made : for example, when the circumference increase is 3 cm., the range of lung expansion is 850–1460 c.cm., and when it is 6 cm., the range is 1290–2590 c.cm.

The error of the method has been worked out by measuring two men daily for 30 days : the measurements were all done at 8.30 AM in order to avoid any changes that might possibly be due to diurnal variation. The findings were standard deviations of 169·2 c.cm. and 214 c.cm., with probable errors of 7·8% and 9·6%, and thus a mean probable error of 8·7%.

Dyspnœa in Recruits

A number of Army recruits in their primary training or corps training periods were referred to the medical specialist because dyspnœa made them unable " to keep up with the rest." Some had signs of chronic bronchitis, a few had valvular heart disease, and some showed da Costa's syndrome (effort syndrome). But there were many who had normal hearts, normal blood-pressures, normal response of pulse-rate to standard exercise (the so-called exercise tolerance test), seemed to be psychologically normal and stable, and had normal lungs. Men in this last group might easily have been labelled neurotic or even malingering, but it soon became obvious that their lung expansions fell far short of normal—despite the fact that their chest expansion at nipple level was up to as much as 3 inches.

To establish the range of normal measurements by this method, we measured 68 men who did not complain of any real respiratory distress during their training ; and to these are added the 51 students already mentioned. To allow for different size and build, it was thought

advisable to express the results according to body surface area, obtained from the Du Bois height-weight tables as used in basal metabolism determinations. (This accords with the conclusion of West, 1920.) In the remainder of this paper the figures given are of lung expansion per sq. metre body surface.

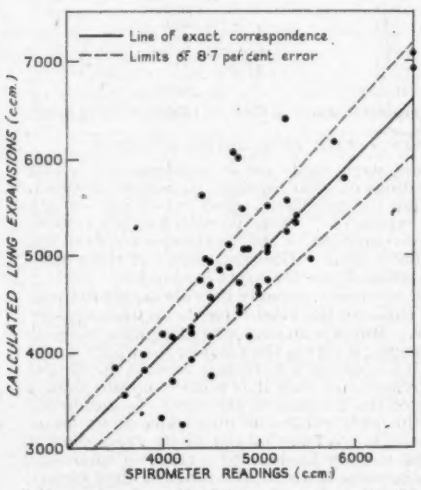
The normal group is split up into three subgroups comparable with groups A, B and C of Dreyer and Hanson (1921). These are :—

Athletic men, who have taken part, or still take part, in active games and sports, such as football, swimming, and running.

Active men who are physically active but have never played organised games or taken part in athletic contests, except in a minor way up to the age of 14 or 15; such men as enjoy cycling or hiking.

Never active men who have never played games and since leaving school (usually at the age of 14) have always had sedentary, slow, or "light" work, such as gardener, chauffeur, clerk, shop assistant, or agricultural labourer. Many of these men were actually much slower than their friends—e.g., in the cross-country runs—and found difficulty in keeping up on the forced marches; but they did not volunteer complaints of undue distress on their training as far as they had gone.

1



It is clear that the "never active" will merge imperceptibly into the fourth group, the *effort-intolerant*.

For the four groups the lung expansions per sq. metre are shown in fig. 2 in the form of a scatter diagram. As is to be expected in all vital measurements, the groups tend to overlap. Naturally, too, the athletic group show the highest range, with the active group within their lower range. The effort-intolerant only just overlap the athletic group in the latter's lower range; in fact, except for 5 of the former and 2 of the latter, they do not overlap at all.

"Numerous statistical studies indicate that age has little influence on the vital capacity of adults between 20 and 50 years" (Wiggers 1939). To show that the differences between the groups are not simply due to age, a scatter diagram of the subjects' ages (reversed in order of magnitude) is shown parallel to the lung expansion figures.

From this diagram the following conclusions were at first tentatively drawn :

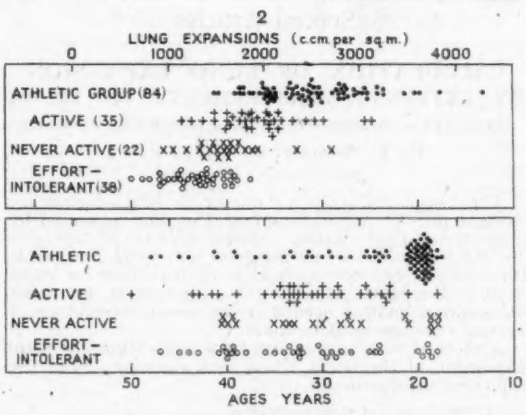
1. If a man has a lung expansion per sq. m. of 1900 c.cm. or more, then (as far as this measurement goes) he should be capable of any exertion required of a front-line soldier.

2. If his lung expansion per sq. m. is 1100 c.cm. or below, it can be said that he is physically incapable of such effort.

3. If his lung expansion per sq. m. is between 1400 and 1750 c.cm., and he is genuinely dyspnœic during training and fails to improve, he is unlikely to reach the standard of front-line action. The likelihood of his doing so is even less if his expansion is between 1100 and 1400 c.cm. per sq. m., and/or his age is over 30 years, when his joints and muscles will be more "set."

In all problems of human measurements it is difficult to draw hard and fast lines, but the figures suggested that Army training will seldom make a front-line infantryman out of a man whose lung expansion remains below 1500 c.cm. per sq. m., after his initial training.

2



A PRACTICAL TEST

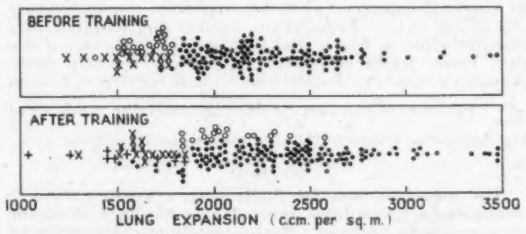
At the suggestion of Lieut.-Colonel J. W. Patterson, RAMC, of the War Office, and Major J. E. Lovelock, RAMC, of the Army Physical Training Depot at Aldershot, these tentative conclusions were tested. A batch of recruits taken straight from civilian life into a physical development centre, were measured at the beginning and end of their six weeks' training, and the results of the measurements were compared with their performance. In the last week of training all recruits undergo a "final composite test," which involves (1) carrying a man of the same weight 100 yards, (2) an obstacle course, (3) a 2-mile run and (4) a 12-mile march. This test is done in battle order, and (except part 1) carrying a rifle. Parts 1, 2 and 3 must be completed within a certain time; after 5 minutes' rest the 12-mile march is done—with 2 halts—again with a time-limit.

The main question to be answered was : If a man has a lung expansion which remains below a certain critical level, will dyspnœa prevent him from performing the final test? The two scatter diagrams in fig. 3 show the lung expansions per sq. m. of 175 recruits before and after training.

1. All but 2 of the men who failed in the test through dyspnœa had lung expansions of less than 1800 c.cm. per sq. m. at the end of training.

2. At the first examination 35 men had lung expansions of less than 1800 c.cm. In 19 (over half) of these the lung expansion was improved to above 1800 c.cm., and they passed the test.

3



3. There were 6 men who passed the test, at a time when their measurements came below 1800 c.cm. The figures from these 6 before training were 1900, 1730, 1990, 1890, 1900, 1750. It is not clear why their lung expansion should diminish to or stay below the critical level, and yet the test was passed. No later examination was possible.

4. The "after training" part of the diagram includes 9 men referred because of dyspnœa in training and/or inability to pass the final test because of it.

The results suggest that there does seem to be a critical level of lung expansion. If after initial training a man has a measurement below about 1800 c.cm. per sq. m.,

he is not likely to make an infantry soldier. On the other hand, if a lung expansion below 1800 c.cm. per sq. m. is found in a completely untrained recruit 18 years old, it is impossible to predict the effect of training on his lung expansion and performance. The question whether further training will improve those who fail to come up to standard within 6 weeks is now under investigation.

The 2 relevant cases in this group support our original tentative conclusion that a lung expansion below 1400 c.cm. is unlikely to improve up to a figure compatible with good exercise tolerance.

Discussion

Dyspnœa is one of the outstanding problems in medicine. Measurements of vital capacity have by no means provided the answer to all problems of shortness of breath on exertion; for example the contentions of Peabody and Wentworth (1917) that cardiac dyspnœa is due to diminished vital capacity are not wholly accepted. Even the dyspnœa in such a condition as emphysema, where a mechanical cause is apparently obvious, is not definitely explained. "The amount of air drawn into the lungs with each breath and during each minute is normal or even increased in emphysema" and "with so extensive an impairment of both inspiration and expiration it is not surprising that vital capacity and chest expansion are reduced" (Christie 1944).

Diminished vital capacity is seen in many states having dyspnœa as a main symptom, such as pleural effusions, gross pulmonary collapse or fibrosis, pulmonary œdema, and abdominal conditions interfering with the action of the diaphragm. We are not concerned here with such gross disorders of respiration, but rather with dyspnœa at a much higher level of effort—namely, of apparently normal men under physical stress.

Dyspnœa is a symptom; whether or not the person under examination is dyspnœic on effort, or plays games without distress (one self-styled athlete could only play in goal!) is in the main found out by questioning and not by observation. Occasional motives for false answers in either direction can be easily imagined, and the questioner must assess, from the subject's history and attitude, the reliability of his answers.

Many men in their normal lives never have to exert themselves. The effort-intolerant group under investigation comprises men who, as far as could be judged from their history, from personal observation and from observation by their MOs, company officers and NCOs, had tried their best, but at some stage in the ladder of progressive training could go no further.

The method described provides one, though only one, measure of a man's capability of physical effort. If a man complains of inability to do primary or corps training because he is short of breath, and if after two months training he is found to have a lung expansion of less than 1800 c.cm. per sq. m., he can on this finding alone be regarded as having "a category B constitution," and can then be posted to a unit not demanding the highest standard of physical fitness. The method is easy and quick, and requires no technical skill on the part of the man or his medical officer, and no apparatus beyond a tape-measure and some simple mathematical tables. It lends itself to further investigations in the assessment of Army Physical Training Corps methods. Finally it gives an easy clinical measure which is far more accurate than the conventional "chest expansion," or a rough clinical impression of moderate or poor chest expansion.

Summary

1. A method is described whereby the maximum expansion of the trunk on inspiration can be calculated from external measurements of the thorax and abdomen.

2. This figure is shown to be a reasonable approximation to the vital capacity of the lungs. It is therefore called the lung expansion.

3. The lung expansion of recruits before and after training has been related to their performance in endurance tests.

4. Measurement of the lung expansion is a practical means of assessing, on a purely structural basis, a man's capacity for infantry training.

My thanks are due to Prof. B. A. McSwiney, FRS, and Dr. C. C. N. Vass of St. Thomas's Hospital, London, for their generous help and encouragement; and to Captain J. Buchanan, RAMC, for providing much of the material for the work, and to the Commandant and staff of a physical development centre for their help and efficient collaboration.

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UNWANTED CHILDREN

MOST people take the fact of home as a matter of course. This is as it should be, at least so far as children are concerned. Perhaps the most important element in a child's happiness is the unconscious assumption of security and permanence involved in having a home—somewhere where he belongs, where he has a right of entry at all times, and in all circumstances, and where he is not merely tolerated but loved.

Reduction of a cartoon by Miss E. Fortescue-Brickdale, RWS, which appeared in *Maternity and Child Welfare*, April, 1920.

There are already in this country some 80,000 children being brought up in public or voluntary residential homes, and the number of orphan or destitute children for whom some form of state provision is required will inevitably be greater after the war. One new type is indeed a direct outcome of war conditions—the unwanted or deserted evacuee. In a collection of essays,[1] published by the Commonwealth Fund of New York, Prof. J. M. MACKINTOSH has dealt with the problem of evacuees and their future. Nobody, he says, ever pretended that it was good for children to be separated from their parents: evacuation was a matter of security, which was held to be sufficiently important to outweigh its obvious disadvantages. The homecoming of children who have been away from their parents for long periods will call for careful adjustment, and there will be scope for the service of good psychiatric social workers to help in the transition. Some have actually profited by evacuation. Dr. Mackintosh's view is that, speaking generally, children fare best in their own homes but, if parents are indifferent, neglectful or cruel, children are better separated from them, "always provided that they are not placed in the deadening atmosphere of an institution."

From surveys undertaken, there appear to be an appreciable number of evacuated children whose parents are indifferent or even hostile to their homecoming. Some have been definitely abandoned, neither father nor mother being traceable; others are neglected, receiving no visits, letters, parcels or clothing; while a third group consists of children whose homes are unsatisfactory for various reasons. Householders will not unreasonably expect to be relieved of their evacuees as soon as hostilities cease. Some accommodation for children not immediately claimed by their parents will have to be found, and this must not be the local public assistance institution.

* * *

The problem of the unwanted or otherwise homeless child is of course no new one, but a correspondence in the *Times*, started by Lady ALLEN of HURTWOOD, has brought out a great deal of evidence to support her contention that many children in institutions are being brought up "under repressive conditions that are generations out of date and are unworthy of our traditional care of children." A nursery school teacher states that her own inquiries in the last three years have revealed such conditions as children being forcibly fed by holding noses,

1. The War and Mental Health in England. (Oxfd Univ. Press Pp. 91.)

a three-year old child punished for a temper tantrum by being put to bed in a dark room, food kept over from meal to meal until it is eaten, and meals taken in compulsory silence. She also found nurses so pressed for time that they worked in a chain system, one washing twenty pairs of hands, another combing twenty children's hair, and the like. Such an atmosphere, she claims, is as harmful to children as actual cruelty, and makes it impossible for a right relationship to be established between the children and those in charge of them. The Rev. A. G. B. WEST considers that, while physical care of children is a comparatively simple matter, it is in the field of morale that the child deprived of normal family life needs compensation, the most effective form of which is to enhance the prestige of the child. This point is again emphasised by Miss MOBERLY BELL. She rightly states that every child in a family is of unique importance and has a definite contribution to make. Scope for personality is almost impossible in an institution where the child is swamped among large numbers of others of his own age. These facts are sufficient to justify full investigation of the needs of the unwanted child, so that we may know how far short we fall in meeting them at present.

No-one denies that there are good residential homes, or that many institution-reared children make good citizens and lead useful and happy lives, but there is too much evidence that children already handicapped by their circumstances are not being handled in a way which will help them most.

Probably the majority of unwanted children are illegitimate, and their troubles begin simultaneously with birth or even before. Adoption is sometimes a happy solution, but the abuses incidental to adoption are not entirely obviated even by the Act of 1939, since the control exercised over societies and organisations is far less complete in the case of private individuals. Illegitimate children have a special claim to protection, and the civil defence and general purposes committee of the London County Council has recently submitted a report to the Minister of Health for dealing with problems concerning these children under war conditions. It is proposed that metropolitan borough councils should compile lists of foster-mothers approved to undertake the care of children up to the age of five years, the guaranteed payment being 17*s.* 6*d.* a week for a child under twelve months, and 15*s.* from one to five years (subject to revision after six months). This scheme to be of lasting value should be extended to carry the child throughout youth.

* * *

Good foster-homes, properly supervised, would be the selection of choice for most unwanted children. A normal family, consisting of father, mother and children of varying ages, is the best and most natural substitute for the real home of which such children are deprived. But the supply of good foster-homes is far from sufficient and sometimes if the child is difficult the foster-parents tire of keeping him, and he may be moved to a number of different families in the course of a few years, thus losing any sense of continuity and security, and drifting into delinquency. It is essential for local authorities to take real trouble to encourage foster-mother schemes in every area. Women's organisations might arrange meetings to explain the plan, the help of the local press might be enlisted, and once a nucleus was formed the scheme would probably grow by its own virtue. Some women might also be found willing to act as landladies to the mothers of young babies, taking care of the babies while the mothers are out at work. Mothercraft training courses are popular in the women's Services, which suggests that many women would welcome a course in child care which would fit them to be foster-mothers under an approved scheme. When large numbers of women are demobilised at the end of the war, an effort should be made to get some of them to make homes for destitute children, whose welfare is one of the most urgent and human tasks with which the nation will be faced.

Since, however, there is little prospect of placing all unwanted children in private families, probably the next best system would be one of small "homes" rather than large institutions. The clerk of the Lindsey county council has described how, since 1930, when the council became responsible for institutions previously managed by boards of guardians, the children from 5 to 14 have been housed in a number of villas under carefully selected foster-mothers, attending the local churches and schools, and joining local youth associations. On leaving school efforts are made to find situations, both boys and girls being boarded out, and their wages subsidised where necessary until they become self-supporting. The scheme has proved very successful, and many of the boys and girls come back to their old homes when on leave as a matter of course.

* * *

Until we can abolish institutions by finding real homes for all our children, every possible compensation should be provided for the lack of normal home and family life. They should always have their own clothing: it is not sufficient to be provided with a clean shirt once a week, regardless of who wore it last. They should have personal possessions and pocket money, and the aim should be to fit every child for independent life as a responsible member of society. Children with few or no belongings of their own can hardly be expected to grow up with respect for other people's property. Above all, they should be cared for by the kind of people described by Mr. BERNARD SHAW as "both humane and cultivated." Given the right type of women, of whom there are probably many, it should not be difficult to devise a fitting training for them.

The three ministries of Pensions, of Health, and of Education, and the Home Office are all in some measure concerned with the care of unwanted children. The proposal of Lady Allen of Hurtwood for a public inquiry, sponsored perhaps (as the *Times* suggested in a leading article) by the Ministry of Reconstruction, should be undertaken on broad lines and without delay. The nation's children are its most valuable possession, and we should all see to it that they get a square deal.

SOCIAL SECURITY SCHEMES

A SURVEY of the present position of social security legislation in Australasia has been published by the education service of the Australian Army.

NEW ZEALAND

This scheme is single and comprehensive. It includes child endowment, unemployment benefit (and employment service), sickness and disability benefit, invalidity benefit, war disability benefits, miners benefits (invalidity, disability, and funeral), widows benefit, orphans benefit, old age benefit (gradually being replaced by a universal superannuation benefit), comprehensive free medical, hospital, maternity, pharmaceutical, X-ray and massage services. There is no provision for marriage grant, maternity allowance or funeral benefits, such as were advocated in the Beveridge plan, but free maternity services are provided, and funeral benefits for invalided miners. The benefits cover a much wider field than those in the National Resources Planning Board's scheme of social security for the USA. Moreover, the New Zealand scheme is actually in operation, whereas British and American plans are largely on paper, and are confronted with considerable political opposition.

The New Zealand scheme has been working in favourable circumstances, and has not yet been thoroughly tested. Since war broke out there has been little unemployment in the country, which has meant, not merely that unemployment benefit has almost vanished, but that families who were short of food and clothes during the lean years 1929–35 are now enjoying really adequate standards of living, and of health and fitness. Moreover, the years since 1938 have been good export years. This is vital to an economy which depends greatly upon export trade to maintain its guaranteed farm prices, its employment level and its national income generally. It does not necessarily follow, as some hostile critics of the New Zealand Social Security Act have suggested, that an export slump would undermine the stability of the scheme: a well-timed and vigorous programme of housing and national development works, and stimulation of home consumption by other means should enable the Dominion to head off any internal tendency towards a slump. Whatever the level of New Zealand's annual flow of goods and services,

the social security system helps to spread them more evenly among all classes and to maintain a national minimum living standard. Even a short experience of the comprehensive system has proved its great benefits for the individual, the family and the nation.

The basic principle of the scheme is universality. Its benefits are available to everyone (subject to conditions about maximum income and eligibility), and everyone in receipt of income has to share its cost. First, everyone has to register with the Social Security Department. The annual registration fee is £1 for males over 20, and 5*s*. for women and young people. Then, as part of his general taxes, everyone in receipt of income pays 1*s*. per £1 of income directly into the Social Security Fund. Thus a man receiving £1000 yearly would, as part of his taxes, contribute £50 specially to the fund; while a man with £200 yearly would contribute £10. The difference between revenue from registration fees and earmarked taxes on the one hand, and the total cost of social security on the other, is made up from consolidated revenue—i.e., from general taxation. The money payments are not very different (allowing for exchange rates) from those suggested in the Beveridge plan; but health benefits of the type now offered in New Zealand have only been discussed in vague general terms in the USA, Britain or Australia. These are the following free health benefits, with the dates on which they came into force: treatment in state mental hospitals (as from 1.iv.39); maternity benefits, medical, nursing and hospital services (15.v.39); hospital benefits, inpatients, with no time-limit, part fees in private hospitals (1.vii.39); hospital benefits, outpatients, with no time-limit (1.iii.41); medical benefits, capitation scheme (1.iii.41); pharmaceutical benefits (5.v.41); X-ray diagnostic services (11.viii.41); medical benefits, general medical services, as alternative to capitation scheme (1.xi.41); massage benefits (as from 1.ix.42).

In addition to free medical, nursing, hospital, X-ray and massage services, and free medicines and drugs, the New Zealand Government has undertaken various services for children which might be grouped broadly under the heading "preventive medicine." These include milk-in-schools and apples-in-schools schemes; 230,000 out of 280,000 children now receive milk regularly at school. There are regular school medical inspections, and health camps have been provided for delicate children. A school dental service has its own clinics, and there are 351 treatment centres up and down the country. The ultimate aim is to extend this service to the whole adult population.

AUSTRALIA

The Commonwealth was among the pioneers of social services. Services and benefits were developed one by one, usually within the states first, and later, in some cases, on a Commonwealth-wide basis. Of recent years other countries have caught up with us and (New Zealand especially) pushed ahead of us. Some of our social security services have remained state responsibilities: such are unemployment benefits, health and school-health services, child welfare services, miners pensions and workers compensation. The Commonwealth government has, however, made spasmodic advances into the field of social security. Its major responsibilities, so far, are: old age pensions (1909), invalid pensions (1910), maternity allowances (1912), war pensions (1914), child endowment (1941), widows pensions (1943), invalid pensioners wives benefits (1943), old age pensioners funeral benefits (1943), new-style maternity benefits (1943).

Most of the legislation covering these benefits has been overhauled and improved from time to time, and the amounts of the benefits increased. The Commonwealth government has also contributed towards some of the social services under state control—notably to the financial side of unemployment relief during the depression years; but it is still true that there has as yet been no comprehensive attempt to weld our social security services into a systematic whole in which the amount of one benefit or allowance bears close relationship to all others, and in which all such payments are related to the notion of a national mimimum income below which no Australian must be allowed to fall.

In July, 1941, a Parliamentary Joint Committee (consisting of three members from each side of politics) was appointed "to inquire into, and from time to time to report upon, ways and means of improving social and living conditions in Australia, and of rectifying anomalies in existing legislation." This committee has already pointed out that Australian social services have tended to develop in a piecemeal fashion. For a campaign against poverty to be successful they consider it essential to have a Commonwealth Social Security Act. The all-party committee squarely accepts community responsibility for social security.

> "For long it was held that poverty was the fault of the individual, and was solely due to inefficiency, improvidence, dishonesty, drunkenness and the like. More modern opinion is that poverty is mostly not the fault of the individual but of the environment in which he lives. Social services were developed largely because of the conviction that it is misfortune, not inherent evil, which brings people into want, and therefore it is the duty of the community to mitigate the worst effects of that want."

The sixth interim report of the committee criticises existing medical and health services in Australia, and suggests that "the ultimate solution will probably be found in a full-time salaried medical service, with complete medical, hospital and public health services available to all, financed by a tax on incomes." Such a solution, however, is regarded as a long-range objective, since, apart from obstacles to its introduction until after the war, it is opposed at present by the bulk of the medical profession. The committee believe that changes should be introduced by evolutionary developments, over a period of years, so that their merits can be thoroughly tested by practical experience.

In the meantime, they recommend full-time salaried doctors for scattered districts, and part-time salaried service at local clinics and hospitals—the clinics to be centrally controlled and equipped, but decentralised in towns and suburbs to relieve the present pressure on outpatient departments, and to encourage group practice by doctors.

Reconstruction

ARMY EXPERIENCE AND A NATIONAL HEALTH SERVICE

FROM A FORMER MEDICAL OFFICER

IN many respects Army medicine is unlike any form of national medical service in peace-time. The military conditions under which the Royal Army Medical Corps has to operate impose certain functions which would be redundant in a civilian service—for example, the need to be mobile and to deal with epidemics of trauma. On the other hand both civil and military services aim at providing complete medical facilities for the entire population at risk, irrespective of their individual means to pay, lay great stress on prophylaxis and are organised centrally; which are important similarities. Consequently Army experience should be valuable in planning a new national service, and it may be useful to summarise some opinions I have formed in the past five years.

FEATURES TO BE AVOIDED

The fundamental criticisms levelled against Army medicine can be, and often are, summed up in the words "bureaucracy" and "red tape." It may be that these are to some extent inherent in the military machine and cannot be avoided in the Army; but they would be fatal to any efficient civilian service, and it is understandable that many object to a national service through fear of them. Army experience suggests that the main problems are these.

1. *Method of promotion.*—In the Army consultant and specialist appointments are made on ability; but administrative ones are still mainly made on seniority, with the natural result that incompetent men may hold important posts. Promotion by ability alone is a sine qua non of an efficient service, and ability is not necessarily synonymous with age. As a corollary it would be wise to introduce a system of pay rising with seniority, independent of increment on promotion; for it is only reasonable that a man should be able to expect to earn

more as his personal responsibilities increase. Alternatively marriage and children's allowances might be preferable.

2. *Appointment to administrative positions.*—Administration is but one specialty, and it is incongruous that it should be rewarded more highly than other medically more responsible and difficult ones. Full-time administrators should commence their specialty early in their careers and in no case should an experienced clinician find himself obliged to turn over to administration so as to retain his chances of promotion. The suggestion of having clinicians working part-time on advisory boards—e.g., hospital inspection boards—will have to be subjected to the test of trial and error; it may well prove satisfactory.

3. *Internal democracy.*—The most serious failing of the Army service is that the senior officer has no compulsion to consult with his juniors, nor is there any method by which the junior officer can express his criticism of the senior's actions. In view of the necessity of maintaining absolute discipline it is said that nothing can be done about it. This may or may not be so; but it is certain that a similar situation would be most unfortunate in peace-time. Army apologists continually underestimate the harm done by bad commanding officers, who may have reached their position through seniority and who are secure so long as their juniors are efficient. The fear of serving under such administrators and having no means of complaint deters many who otherwise recognise the benefits of a national service. Further, it is beyond the capacity of any one man to solve all the myriad problems of a large organisation. In the industrial world the joint production committees have shown how greatly efficiency may be increased by bringing representatives of the workers into consultation with the management, for only thus can the experience of the man on the job be utilised. Also there is the question of maintaining the interest of the worker in his work. In war we are all united in the common aim of defeating the enemy; in peace this unity may be less strong. The best way of maintaining it, as of maintaining interest in routine work, is to give to each the maximum of responsibility in the running of the enterprise.

For all these reasons a peace-time service demands the fullest internal democracy within the medical profession—not only of doctors themselves but also of all health workers, from porter to hospital treasurer and pharmacist to social worker. This is not to suggest that men should be elected to responsible medical positions by the kitchen-maid and laboratory assistant, but that administrative officers should have to consult regularly with representative committees and (better still) from time to time with the entire body of health workers concerned. The only way to avoid bureaucracy is to create a real working democracy, and the criterion of this is that no-one should have to carry out a scheme of work on orders from above without having taken part in formulating it as a project from below.

4. *Issue of supplies.*—Control over the issue of supplies is very strict in the Army, and it is not infrequent to hear medical officers cursing at the "red tape" which slows down the process of getting necessary replacements. This is largely due to two factors, real shortage produced by war conditions and the necessity for keeping consumption down to a minimum at the base so that forward units shall not go short. The complaint of red tape is comparatively seldom heard at the front—so long as material is in supply there is no difficulty in getting it. In view of these special military conditions it is not justifiable to criticise military methods too severely. Unfortunately public medical authorities have largely copied the Army practice—which is indeed widespread in all branches of the Civil Service—and there is good reason to presume that a National Health Service would do likewise. This would be fatal. To give an example, when a piece of crockery is broken the bit showing the authority's mark must be saved, or it is impossible to get it replaced. In the Army when a syringe is broken—as will happen in the best-run wards—unless the sister in charge can trace the offender she nearly always ends up by paying for it herself. These methods cause injustice and even more irritation. Too strict regulations make criminals out of the most moral of us. It is essential that in the National Health Service some trust should be shown in the issue and replacement of equipment; to issue apparatus to a health centre as if it were an Army camp reception station would discourage the keenest.

5. *Forms.*—It is often stated that an Army doctor's time is largely spent in pen-pushing and form-filling. How far is this criticism justifiable? Certainly a hospital doctor has to do a great deal of writing, and it appears all the more in contrast to the minimum of note-making done by most practitioners. But the real difficulty is not so much the number of notes that have to be made as the lack of clerical assistance in making them. Generally speaking the Army demands no more from the doctor than that necessary in the interests of the patient, control of epidemic disease and scientific analysis. It is certainly no more than in an efficient civil hospital. Whilst admitting that redundancies do at times occur it is difficult to agree with some people who appear to resent giving any kind of information. A doctor recently wrote to the *Daily Telegraph* citing as an example of "bureaucratic stupidity" the fact that he had to answer a question whether an injury (in this case the loss of an eye) would improve. Certainly a stupid question in the circumstances, but what would he have had? A separate and special form for this particular injury in which this question was omitted? It will certainly be an important duty of medical committees to watch for unnecessary multiplication of forms and to insist on their withdrawal when circumstances alter to make them redundant; but Army experience chiefly demonstrates the need for doctors to have good secretarial assistance, an aim which should be easy to fulfil when health centres once get going.

6. *Censorship of publications.*—It is understood that military censorship is necessary, but none the less its effect is to cause much irritation and friction among medical officers. The delay caused by submitting articles "through the usual channels" discourages all publication, whilst the official attitude which bars any criticism of the Army only serves to prevent its faults from being remedied. Complete freedom of all publication is absolutely necessary in any successful national service. Several large authorities have gone far to recognise this by withdrawing the rule for submitting purely "scientific" articles; but they would be much better advised to allow their officers complete freedom of the press. If a service is good its actions will speak louder than the grumbles of a few dissatisfied individuals.

SUMMARY

Allowing for the differences due to specific military conditions, there would be important similarities between Army medicine and a National Health Service.

Five years' Army experience suggests some lessons that should be learnt in organising a civilian service. (1) Promotion must be by ability and not seniority. (2) Administration should be considered a separate specialty and should not provide a disproportionate number of the higher-paid posts. (3) There must be adequate opportunity for all health workers to express their views on all aspects of the service, through elected representative committees and periodic conferences of all concerned. (4) The method of issue of supplies must not be too rigid. Some trust should be shown to medical staff until individuals prove themselves unworthy of it. (5) Adequate note-making and recording necessitates a certain number of forms. The greatest need is for secretarial assistance. (6) Freedom of publication should be absolute.

US ARMY: RECOVERY OF WOUNDED.—The office of the Surgeon-General of the US Army announced on August 19 that "experience to date has shown that fully 96% of all men wounded on battlefields recover, and of these about two-thirds return to duty." During the period June 25 to July 25 23% of those discharged from hospitals with serious physical limitations, who were given the option of discharge from the army, elected to remain in military service. Casualties returned to civilian life will receive continued hospital care as required, "together with opportunity for vocational rehabilitation or academic advancement through study in schools and colleges, depending on circumstances and personal preference."

In England Now

A Running Commentary by Peripatetic Correspondents

ONE of the anomalies of our existing maternity service that I should like to see removed concerns antenatal clinics. In many of these the examinations are carried out by doctors who will in no circumstances whatsoever be called on to attend in their confinements the women for whom they provide antenatal care. Clearly here is a state of affairs in which incentive to good work is largely lacking, for it is surely only the moral superman or woman who is going to be seriously exercised over, say, a question of disparity between the size of the foetal head and maternal pelvis when he or she knows that somebody else will have to hold—and deliver—the baby. If a national maternity service on the lines contemplated by the RCOG pamphlet comes into being there will be a lamentable shortage of obstetric consultants. Much of the soundest obstetrics in this country is done by experienced general practitioners, many of whom have learnt their midwifery literally by blood and perineal tears. But they *have* learnt it. Here is a valuable source of obstetrical experience which is likely to remain untapped, since many of these practitioners have never held resident obstetric appointments and are therefore eligible to take neither the diploma of the RCOG nor that of master of midwifery of the SA, despite the fact that they may have had obstetrical experience in private practice amounting to hundreds or some thousands of cases. It is true that such men could render themselves eligible by taking six months off and holding an obstetric appointment at an approved hospital, but where either in war or peace-time is a general practitioner to lay his hands on six months leisure, for this or any other purpose?

* * *

Somebody says that the white-paper on the National Health Service shows weakness in looking upon the general practitioner as subordinate to the consultant and specialist and adds that such a position is not satisfactory to either doctor or patient. This point of view will certainly be shared by many but I doubt whether they will all carry their agreement to its logical conclusion. When I worked in Vienna many years ago there were two classes of professor in the university; the *ordentlicher Professor* and the *ausserordentlicher Professor*. The former was head of the department and member of the faculty, the latter did most of the teaching. The same *Witz* was made about them as is made about specialist and GP over here: the former knew more and more about less and less; the latter knew less and less about more and more. The specialist—especially one who achieves the highest rank—tends to become so preoccupied with the details of his own subject that other branches of medicine, or for that matter knowledge, fade into insignificance. We have indeed met those who would fit all diseases into the framework of Freudian psychology or attribute all ills to chronic intestinal stasis. Similarly, the expanding universe of medicine taxes the GP, who must gain a smattering of an increasing number of subjects. Who can say that the one attitude requires more intellectual effort or greater skill than the other? Why then should the one class be remunerated more than the other, either financially, with honours or with power? Again, it is not to be denied that the general practitioner has as great, if not greater, responsibility to his patient than the specialist. A good case could be made out for considering the GP as the more important partner in the conjoint work of the family doctor and the consultant. Some day we may see the successful specialist aspiring to become a general practitioner. I confess the idea pleases me, though I doubt whether the Colleges would concur.

* * *

My maid, Lavinia, is one of the most cheerful women I know, but even her pleasant face clouded over at the wailing siren. "Why can't they attend to their own affairs in Germany," she demanded, "instead of coming over to us?" She was referring to the attempted assassination of Hitler. "It's nothing but destruction, —destruction all the time. All these young lives wasted; it's terrible. Theirs as well as ours, and in Japan too. What will it be like after the war? What good will all this do to anyone?" "No good at all," I replied. "Women ought to run the world after the war." Lavinia's outburst left me thoughtful. I remembered an occasion, some years ago, when I went with a friend and our respective husbands to Olympia. We came across a stall where you could throw balls and smash crockery, so many balls for a penny. The two men enjoyed a perfect orgy of destruction; but my friend and I looked on rather coldly. (How glad we should be now of those cheap cups and saucers and plates.) The incident seemed to me a significant little side-light on differences in sex psychology. None of us would have enjoyed breaking china at home; but the men were delighted to have an opportunity of indulging harmlessly their repressed destructive impulses, while to the women it made no appeal at all. This same husband of mine asked me plaintively the other day, "Why do little boys have to pull and tear at the hedge as they go past?" "Innate aggression," was my reply. He smiled at the psychological term for pure devilment. D. W. Harding deals with this subject in the *Impulse to Dominate*, a book which everyone should read. His suggestion for preventing war would be to psycho-analyse all children in the nursery. I suppose one would begin with the naughtiest little boys; and then a vision comes to me of all the naughty little boys in the world (which means practically all the little boys, bless them) trooping up for treatment, little boys of every race and colour, with every sort of inborn disposition from cherub to devil ... and imagination fails me. I did not mean my remark to Lavinia literally. One would have to deal with the family as a whole, as was recognised by the able authors of the *Peckham Experiment*, another book everyone should read. A home where Mother rules and Father has no say is as badly adjusted as the one where Father holds sway alone (cf. the Barretts of Wimpole Street). The best and happiest families are those where Mother and Father are in harmony and exercise joint authority, where Father's discipline and Mother's mildness do not contradict one another but are complementary. Surely the larger family of the nation should be organised in the same biological way; the leaders of the people should be men and women in equal proportions and with equal responsibilities. Women always stand, like Lavinia, consciously or unconsciously, for the preservation of life, and their counsels should be heard.

* * *

When Swift wrote the "Houyhnhnm" bit of *Gulliver's Travels*, he must have been thinking, in the prophetic way those authors have, of Poona in 1944. The easiest way to tell a man from a horse out here is to look at the clothes; rags and tatters are diagnostic of humanity, but the horses are well-clothed and groomed, and each one has its own servant who sleeps in the corner of the room (it seems a pity to call it a stable). This difference in clothing is an accurate reflection of social status; for although the noble animals are good-natured enough to obey their lackeys, they know very well that whoever starves in India it won't be the horses. Even where sahibs are concerned, the horses have still the best of it; for a greater loss of caste is involved in looking after a foreigner than in taking service with an honest Indian thoroughbred. Not many of the horses out here speak English, so it is difficult to get their viewpoint; but the general arrangements are so much in their favour that they must be indeed captious if they jib at their mild yoke. Once a week they receive formal homage, at the big race-course thoughtfully placed midway between the two British hospitals. And it is there that one can best study the sahibs themselves, their week-long sleep dissipated at one blow by the excitements of the gymkhana. And what sahibs! The rest of the Empire may be going to the dogs; but here in Poona we have our standards. Not that the standards aren't threatened; this war has brought us officers of field rank who can scarcely sit a jeep over rough country, let alone a thoroughbred. But the citadels stand fast. The Turf Club will close its doors before it gives supper to a woman who isn't in evening-dress; the Club of Western India would sooner put vitriol in its chota pegs than Nasik whisky—and incidentally they have erected intangible but very real barriers against us khaki-disguised civilians who form the bulk of the war-time European population.

Letters to the Editor

TESTS FOR SULPHONAMIDE SENSITIVITY

SIR,—W. B. Leftwich (*Bull. Johns Hopk. Hosp.* 1944, **74**, 26) reports that skin sensitivity to sulphonamides can be demonstrated in over 90% of clinically sensitive patients by an intradermal test, using as antigen human serum containing the appropriate sulphonamide. The test is said to be specific for each type of sulphonamide and is based on the hypothesis that the sensitising antigen is a protein-sulphonamide combination in the serum, the sulphonamide acting as a specific hapten. Hoping that this test might prove a useful weapon with which to attack the somewhat controversial problem of "sulphonamide dermatitis," I have attempted to repeat Leftwich's work. His technique was carefully followed. For the preparation of the antigens 6 volunteer soldiers, who had never had sulphonamides before, were each given one of the following sulphonamides by mouth for nine days. The table shows the total amount given to

Drug	*Amount given* (g.)	*Free sulphonamide in serum* (mg. per 100 c.cm.)
Sulphanilamide ..	.. 42	.. 3·4
Sulphadiazine ..	.. 42	.. 6·6
Sulphaguanidine ..	.. 133	.. 2·1
Sulphapyridine ..	.. 42	.. 2·3
Sulphamerazine ..	.. 42	.. 5·8
Sulphathiazole ..	.. 42	.. 3·7

each and the serum level of "free" sulphonamide at the end of the course. Venous blood was taken from each volunteer before and at the end of the sulphonamide administration. The serum from each blood was Seitz filtered, preserved with 0·01% merthiolate and refrigerated. The 12 sera (i.e., 6 "sulphonamide" sera and 6 "control" sera) were then used as antigens for the intradermal tests. The following groups of patients (42 patients in all) were tested with these sera. Groups (3) and (4) were "controls."

(1) Eight patients who had a rash which could quite confidently be attributed to sulphonamide therapy. In these an otherwise unexplainable morbilliform, scarlatiniform or urticarial rash appeared during or after oral administration of one of the sulphonamides.
(2) Fourteen patients with recurrent "eczema" following external application of sulphonamides to a localised skin lesion. Ætiologically these form a rather more controversial group than those in group (1); but there was no doubt that at least *some* of these patients were sensitive to sulphonamides.
(3) Fifteen patients who had had courses of various sulphonamides but had *not* developed any manifest sensitivity.
(4) Four patients with recurrent eczema who had *not* had any sulphonamide therapy.

The 42 patients were each tested with all 12 test sera, which were injected intradermally in 0·05 c.cm. amounts. The dermal weals were watched and measured for 20 minutes and the patients seen again next day. Following Leftwich's criterion, a sulphonamide weal which did not become more than 4 mm. greater in diameter than the corresponding control weal was regarded as negative.

My attempt was unsuccessful. Negative results were given by all patients, although on clinical grounds, of the 42 patients tested, 8 were definitely and 14 possibly sensitive to sulphonamides. It seems likely that there are difficulties in the preparation of the antigens, in the performance of the test, or in interpretation of the results, which are not mentioned in Leftwich's paper.

A. V. JACKSON.

*** Major Jackson, writing from Australia, will not have seen our annotation of May 20 (p. 668), which summarises Leftwich's paper.—ED. L.

POLITICS IN A MEDICAL SERVICE

SIR,—I think this little story will illustrate the conditions of service to which doctors rightly object, and against which we must be protected if we come under state control.

A patient was admitted to a municipal hospital suffering from paralysis due to a cerebral hæmorrhage (BP. 250/190). After many weeks, during which his unwilling limbs were massaged and coaxed to do their best, he was sent to the institution as incurable. This was the approved procedure. Not long afterwards the hospital doctor in charge of the case was sent for by his superintendent, who said that a letter had been received from the controlling authority making a complaint about the treatment given. The patient, it appeared, had written to a prominent politician alleging that he had been removed to the institution prematurely, and that his treatment was wrong, adding as a postscript "I am a —— man and always vote ——." The political gentleman, a power in the local authority, was one whose displeasure might spoil chances of promotion.

The doctor who had treated the case gave a reasoned rejoinder showing that his treatment was correct and the patient was incurable. Judge of his surprise to hear from the superintendent that the patient had been seen in the institution by a specialist and removed to another hospital for treatment. Later, during a chance visit to this other hospital he learned that the case had been recognised immediately as incurable by the resident doctor, and that a specialist was of the same opinion. Both considered the previous treatment to be correct. Some massage was given as a matter of form and the patient was then sent to the institution once more.

The doctor whose treatment had been called in question returned and informed his superintendent that the complaint made by the authority had been proved unjustified. The superintendent, however, was afraid to clear his subordinate of the imputation of wrong treatment, for he was unwilling to point out to the county authority that they had made a false statement. So his subordinate was left with the feeling that he had been given a bad mark unjustly and that it was exceedingly difficult to feel any loyalty to his chief or to the county authority.

In my view loyalty cannot be expected from below upward unless it is given from above downward. Furthermore I think that party politics may wreck the finest state medical service. What safeguards shall we have against situations such as the one I have described?

G. C. PETHER.

SECONDARY PELLAGRA

SIR,—I have read with interest your annotation of June 3 (p. 732). Though I have not yet had access to the paper by Spies, Bean, and Blankenhorn to which you refer, I should like to say a few words about pellagra in Egypt.

Pellagrous manifestations are met with here after severe protracted diarrhœa, and in prisoners on heavy manual work, who often have intestinal disease as well. Slight scaling and pigmentation on the extremities, and slight roughening on friction spots are liable to appear in any debilitating illness, such as diabetes or tuberculosis; but such patients have no other symptoms of pellagra except perhaps some burning in the mouth, or slight stomatitis. The only important group of cases are those of *endemic pellagra*, seen in the fellaheen.

It has often been stated [1] that intestinal disease, or helminthic infestation has an important rôle in the causation of this endemic pellagra. Gastrointestinal absorption of ascorbic acid and glucose, and presumably also of other substances, is deficient in these cases,[2] in which alcoholism plays no part. Furthermore:

(1) Pellagra is prevalent in heavily infested districts, especially bilharzia-ridden (intestinal) Lower Egypt, but is relatively rare in Upper Egypt where the diet is *poorer* but intestinal bilharzia is unknown.
(2) In a group or family sharing the same food, pellagra is seen only in a few members, usually the most heavily infested.
(3) It is very unusual to find a pellagrin who harbours no intestinal parasites.
(4) Pellagra is commonly associated with ancylostoma anæmia and bilharzial hepatic cirrhosis.

The diet of the fellaheen is probably just sufficient for their needs, but has no margin of safety; so any disturbance of absorption, or any excessive call arising from hard work [3] or otherwise, will upset the too nice equilibrium.

1. Biggam, A. G. and Ghalioungui, P. *Lancet*, 1933, ii, 1198; Ghalioungui, P. *Ibid*, 1934, ii, 164.
2 Alport, A. C., Ghalioungui, P. and E. Ghariny, A. *J. Egypt. med. Ass.* 1939, **22**, 191.
3 Wilson, *J. Hyg. Camb.* 1921, **20**, 1.

In all these cases the clinical picture is remarkably uniform, and does not appreciably differ from that described in other countries, except in that peripheral neuritis and subacute combined degeneration are extremely rare (lateral sclerosis being the common neurological finding) and such acute inflammation of the mucous membranes as was observed by Spies in the United States is not seen.

On the above grounds all pellagra in Egypt can be considered "secondary." But for my part I see no point in distinguishing between primary and secondary pellagra. There is no disease in medicine with only one cause; usually there is an interplay of factors, and pellagra is no exception. No clinical difference exists that could confirm the distinction, except in the history of the patient, or in the dominant position of obvious associated disease; and this would only reflect "the mosaic of the prevalent diseases upon which it is engrafted."

Fuad I University Hospital, Cairo. P. GHALIOUNGUI.

BACK FROM THE WARS

SIR,—There must be many in the same boat as the Surgeon Lieutenant in your issue of Sept. 9. May I make the first two constructive suggestions?

(1) Doctors with 5 years war service automatically qualify for their university degree.

This is not very far-reaching when the trend in medical education is shifting towards a general rather than a specialised education, and I believe even in your leader of some months ago you said what better doctors we should be for our war experience.

(2) The British Postgraduate Medical School be taken over for the tuition of returning MO's from the forces, together with free board and lodging.

The postwar grant will perhaps keep wives and children in pocket-money while they are parked on in-laws during this re-education period.

ALSO LOWLY QUALIFIED.

CARDIAC NEUROSIS AS A MANIFESTATION OF HYPOGLYCÆMIA

SIR,—It is a pity that Dr. Greene, in his paper of Sept. 2, did not give a fuller psychiatric history in his five cases. Unless the common causes and the common symptoms of an anxiety state are excluded, it seems possible that the low blood-sugar is a coincidence or else that it brought on the symptoms simply by making the patient feel ill and therefore anxious. It is noteworthy that the first patient sometimes fell to the ground without loss of consciousness. Is this not hysteria? All five cases have some of the symptoms and signs that are common in anxiety states: headaches, dizziness, fatigue, depression, palpitations, tachycardia and sweating. In none of the five cases has Dr. Greene demonstrated a consistent relationship between blood-sugar level and symptoms. Thus in case 3 the symptoms appeared when the readings in the two glucose-tolerance tests were 65 and 63 mg. respectively, but in the insulin-glucose test the symptoms gradually ceased when the reading was 30 mg.; and case 4 had slight precordial pain after the glucose-tolerance test, the last reading of which was 54 mg., but in the insulin-glucose test he had no pain when his blood-sugar had fallen to 32 mg. The appearance of symptoms during the two hours or so of test and their disappearance on eating sugar may well have been due to the suggestion inherent in these procedures.

Tor-na-Dee Sanatorium, Aberdeenshire. F. A. RICHARDS.

FIXED TRACTION IN A THOMAS

SIR,—In my letter about fixed traction in the Thomas splint last week I attributed to Mr. Bankart a mathematical error which he did not in fact make. I assumed him to mean that a vertical upward suspending force had no component along the axis of the splint. His words do not actually say this. In my wards I insist that the suspending cords of the splint should be at right angles to the splint so that they exert no force along the length of the splint. Thus, in my original article this force was not mentioned. By this arrangement play is allowed for the component of the weight acting towards the tuber ischii to keep the splint in contact with this bone. Thus also there is allowed a factor of safety to prevent a movement of the patient disturbing the principle of fixed traction. If the cord is allowed to become vertical its distally pulling component along the splint equals and balances that due to the weight in the opposite direction. Hence Mr. Bankart's statement about the whole system is actually true. I hope he will forgive me for reading into his words a meaning which they do not convey, and I am sure he did not intend. The glaring error was mine.

However, this is a side issue and does not alter in any way the main argument that the pressure on the tuber ischii can be relieved by weight traction at the end of the splint without abolishing the principle of fixed traction.

St. Mary's Hospital, London. CHARLES A. PANNETT.

CHLORAL AND ALCOHOL IN LABOUR

SIR,—The efficiency of alcohol as a pain-killer is well known to all who have to treat fractures in outpatients, and chloral established itself years ago as a useful and safe drug in the first stage of labour. Before the war, therefore, I carried out an experiment on 30 women in labour, 12 of them primips, using a mixture of chloral and alcohol as analgesic. I had hoped to continue the experiment, but no opportunity has arisen.

A dose containing spt. vini rect. fl. oz. 1, chloral hydrate gr. 7½, glycerin min. 60 and water to fl. oz. 8, flavoured with lemon or orange, was given as a drink when the pains were beginning to become painfully strong. In a short time the woman would fall into a deep and peaceful sleep. With each pain she would half wake up, groan, and with the passing of the pain relapse into deep sleep again. In none of the cases did the pains pass off or become weaker, as happens with morphine; indeed, in some of the more nervous subjects the contractions seemed to get stronger and more frequent.

Within an hour the patient usually awoke and was given a second similar dose. If necessary a third dose was given when the head began to distend the perineum during the pains. During the birth of the head the woman always groaned or cried out, but she would fall asleep again immediately afterwards. No ill effects on the child's colour or liveliness were noted. After the delivery of the placenta, for which the patient could as a rule be roused enough to bear down, she slept again. When she finally awoke she would remember little or nothing and be vaguely incurious about the whole affair. In five cases (three of them primips) the mothers asked, after everything was over, "When am I going to have my baby?"

In some of the later cases I tried giving the alcohol and chloral intravenously, suitably diluted with distilled water, but there was no obvious advantage over the oral route and administration became a job for the doctor instead of the nurse.

The light hypnosis and anæsthesia obtained with this combination of drugs, with a considerable degree of amnesia, might make it an ideal substitute for the more dangerous scopolamine and morphine in "twilight sleep."

SHAKESPEAR COOKE.

UNIVERSITY OF GLASGOW.—Dr. Thomas Ferguson, deputy chief medical officer of the Department of Health for Scotland, has been appointed to the chair of public health in succession to Prof. James Mackintosh, who takes up his new chair at the London School of Hygiene in October.

Dr. Ferguson, who is 44 years of age, is a native of Falkirk, and was educated at the High School there. He graduated MB at the University of Edinburgh in 1922, obtaining his MD with commendation two years later. After holding house-appointments at Edinburgh and Falkirk Royal Infirmaries he moved to public-health appointments in Stirlingshire and Darlington before becoming a member of the Home Office Medical Board for Silicosis in 1929. The following year he was appointed a medical inspector of factories for Scotland. He joined the staff of the department of health in 1933 and four years later became deputy chief medical officer. Dr. Ferguson has also acted as secretary of the department's scientific advisory committee and is a member of the Industrial Health Research Board. A lecturer in industrial medicine at the University of Edinburgh, he has examined in public health for the Royal College of Physicians of Edinburgh, of which he is a fellow, and for the Scottish Conjoint Board. At the beginning of the war Dr. Ferguson was in charge of the large EMS hospital set up at Gleneagles.

Public Health

Last Year

THE health of Britain in 1942 was surprisingly good, and in many respects 1943 seemed even better, scoring many low records, as Dr. Percy Stocks has shown (*Lancet*, 1944, ii, 65). But the standardised general death-rate—the most sensitive index of vitality—was higher in 1943 than in 1942, when it reached the lowest level yet recorded, and many of the annual reports of medical officers of health suggest that they have noticed a slight decline in the general health of the community. The obvious fact that many people were abnormally tired may have had something to do with the course of the influenza epidemic, as regards incidence and fatality, but there is no evidence of deterioration in nutrition. Notifications of tuberculosis increased in 1943, but mortality from the disease fell slightly, and the rapid increase in syphilis which started in 1939 has been checked. The year was remarkably free from food-borne diseases and poisonings. We heard nothing of botulism, no more of trichinosis, and less of typhoids and salmonella poisonings than in any previous year. There was a substantial increase in notified dysentery, but most of it was of a mild type which formerly would not have been recorded. Cerebrospinal fever did not decline as rapidly as had been hoped, but poliomyelitis reached a low record and encephalitis was almost absent. Infective hepatitis had a high incidence, and probably also virus pneumonia, though this is uncertain because the disease has only recently been differentiated. The birth-rate of 1943 was the highest since the spurt at the end of the last war, while infant-mortality and stillbirth rates were lower than ever before. Considerable increase in fatal senile diseases and cancer were recorded. The former means probably no more than that the population age advanced; the latter may have a similar explanation, but of this we cannot be sure until the cancer deaths have been analysed for sites and ages. Apart from influenza, the year was free from serious epidemics.

Some localities report 1943 as an unfavourable year, either generally or in some particulars. Thus Dr. C. Metcalfe Brown gives the general death-rate of Manchester as 17·10 for males and 14·08 for females. Compared with the *standardised* rates for the whole country—9·67 for males and 6·98 for females—the Manchester rates appear bad, but we do not know how they will standardise. Manchester has lost about a sixth of its population since the war started, and this loss will be mainly of persons of low-mortality ages.

The figures just announced for the first quarter of 1944 show a higher birth-rate but also a higher death-rate than the corresponding quarter in 1943.

The total effect of the war on the population cannot of course be told until hostilities end. Though the health of our Forces has been good, their mortality must at best be much higher than it would have been in civil life, and it is greatest at an age when normally it would be least.

Infectious Disease in England and Wales

WEEK ENDED SEPT. 9

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 1251; whooping-cough, 1223; diphtheria, 481; paratyphoid, 3; typhoid, 7; measles (excluding rubella), 1138; pneumonia (primary or influenzal), 303; puerperal pyrexia, 117; cerebrospinal fever, 41; poliomyelitis, 24; polio-encephalitis, 3; encephalitis lethargica, 0; dysentery, 622; ophthalmia neonatorum, 63. No case of cholera, plague or typhus fever was notified during the week.

The number of civilian and service sick in the Infectious Hospitals of the London County Council on Sept. 6 was 681. During the previous week the following cases were admitted: scarlet fever, 26; diphtheria, 12; measles, 11; whooping-cough, 16.

Deaths.—In 126 great towns there were no deaths from enteric fever or measles, 1 (0) from scarlet fever, 6 (2) from whooping-cough, 3 (1) from diphtheria, 102 (6) from diarrhœa and enteritis under two years, and 4 (0) from influenza. The figures in parentheses are those for London itself.

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Birmingham and Nottingham each reported 9 deaths from diarrhœa.

The number of stillbirths notified during the week was 185 (corresponding to a rate of 31 per thousand total births), including 9 in London.

On Active Service

CASUALTIES

The following casualties have been announced:

KILLED, PREVIOUSLY REPORTED MISSING

Captain ROBERT ALASTAIR BOYS KINLOCH, MRCS, RAMC

MISSING, PRESUMED KILLED

Surgeon Lieutenant WILLIAM HAMILTON CASSELS DONALD, MB GLASG, RNVR, HM DESTROYER *Boadicea*

AWARDS

The following awards have been announced:

MBE (MILITARY)

Lieut.-Colonel J. A. CHAPEL, MD EDIN., RAMC

Captain W. L. WAINWRIGHT, MB LOND., Home Guard.

On May 8 a small house containing explosives caught fire a short distance from Captain Wainwright's garden. Realising that he could not prevent the fire from spreading he entered the building and carried out a considerable quantity of explosives. While he was doing this the roof collapsed, and he received serious burns about the face, neck, hands, and arms. After having had his burns dressed he insisted on returning to the scene, and gave all the assistance he could until it was found that nothing further could be done to save the building. Captain Wainwright qualified in 1891.

MBE (CIVIL)

A. C. TAYLOR, MRCS, MO i/c first-aid post, Southsea.

During an air-raid a man was trapped in a cellar which had collapsed and was covered with wreckage from the building above. Dr. Taylor and a helper entered the cellar through a small opening between two concrete slabs, one of which was supporting the debris of the house. The casualty was trapped at the base of these slabs and the reinforcement had to be cut with a hacksaw. Each time a piece of reinforcement was cut through, the supporting concrete slabs moved, thereby endangering the lives of the rescuers. Dr. Taylor did not come out of the hole until the casualty was removed two hours later.

MEMOIRS

Surgeon Lieutenant D. N. MCKENZIE was born at Melbourne in 1915 and educated at the Scotch College there. He graduated MB from the University of Melbourne in 1939, and as a student worked at the Royal Melbourne Hospital. Later he held a house-appointment at the Royal Prince Alfred Hospital before he joined the Royal Australian Navy at the end of 1940. Next year he was loaned to the Royal Navy, and he served as medical officer in RN ships and establishments. He was posted missing, presumed killed, in August. He leaves a widow.

E. Jenkins, Southwold

Captain DAVID HALPERN, a former assistant medical officer of health for Ashton-under-Lyne, was killed in action last July in Italy. Dr. Halpern graduated BSc at the University of Manchester in 1933 and took his medical degree there three years later. House-appointments at the Salford Royal Hospital and the Selly Oak Hospital followed and later he settled in practice in Birmingham. At the beginning of the war he gave up his practice to volunteer for the RAMC. He was rejected, but after acting for a time as locum in Huddersfield he tried again, and again was unsuccessful. He was then appointed assistant MOH for Ashton, and the efficiency and thoroughness with which he organised the civil defence services of the town proved his energy and administrative ability. In 1942 he volunteered a third time and to his great satisfaction was accepted. He landed in Sicily with the first assault troops, and when he was killed was serving with the Eighth Army in Italy. Halpern found the best of life in his home and his work, and many friends will miss his enlightened conversation and pleasant companionship. He leaves his widow with a daughter.

Obituary

HELEN LUKIS

M D LOND.

Dr. Lukis was in practice at New Malden in Surrey for 18 of her 45 years, but her early death will be regretted by many outside the district where she worked. Her book on *Problems of Anæsthesia in General Practice* had displayed her ability to a wide circle.

The youngest daughter of Sir Pardey Lukis, director-general of the Indian Medical Service, Dulcie Helen Lukis was born at Simla in 1899. She was educated at St. John's, Bexhill, and the North London Collegiate School for Girls, and graduated as MB Lond. from St. Mary's Hospital in 1923. After house-appointments there she went to the South London Hospital for Women, first as house-surgeon and then as an hon. anæsthetist. On settling in New Malden in 1926 she practised at first alone, but later in partnership with Dr. Christopher Petit and Dr. Gerard Petit. She became surgeon to the Kingston Victoria Hospital and was for several years secretary of the Kingston branch of the British Medical Association before serving as president in 1936.

Her book, which in essay form won the Sir Charles Hastings prize of the BMA in 1934, was thoroughly sensible, full of practical information, and crisply written: before giving an anæsthetic, she said, the practitioner should make sure that he has the confidence of the three important persons concerned—the patient, the surgeon, and himself. Dr. Lukis might well have specialised in anæsthetics or some other subject, but her chief interest and strength lay in the human side of medical life. Her big practice—largely, but by no means wholly, among women and children—included all sections of the population and ranged far. Her mind was quick, her temperament sunny and energetic; but ill health had been in the offing for a great part of her life, and of late years her cheerfulness concealed much. It continued to do so till her death on Sept. 9.

DR. ALEXANDER FRANCIS

G. M. S. writes: Dr. Francis was a pioneer in the best meaning of the word. His work on the treatment of asthma and allied conditions was original, but his investigation of patients was wide in its scope, and he never hesitated to refer anyone to another specialist when the need arose. This is mentioned as an example of his essential broadmindedness; so often when a certain line of treatment (such as he had perfected) is found to be successful, vision becomes narrow and some degree of fanaticism results. Dr. Francis spent his life trying to alleviate a most distressing malady; no trouble was too great for him, and his time and thought were given as abundantly to the most neurotic and boring patient as to the more coöperative type. The affection he inspired was of the kind that endures.

Notes and News

A RACIAL PREJUDICE

THE American negro is one of the newest types of mankind. He is a mixture of many African types, American Indians, and whites, principally of British origin. As such, he is of great interest to the physical anthropologist; while the complicated set of racial prejudices operating against him provide the social scientist with rich material. When the two sciences meet, it is possible to find out how far racial prejudices have any basis in fact. Dr. M. F. A. Montagu, associate professor of anatomy at the Hahnemann Medical College, Philadelphia, has done useful work in drawing together an account of the physical characters of the American negro, and setting them against those of his white cousins (*Sci. Mon., Wash.* 1944, **59**, 56).

One of the strongest and most widespread prejudices is that the negro possesses a unique and particularly objectionable body odour. There is no doubt that negroes have more sweat glands than whites—three times as many in fact—an admirable adaptation for heat regulation in hot climates. But limited experimental studies suggest that the sweat of negroes differs only in quantity and not in nature from that of whites. Perspiration was collected in test-tubes from white and coloured students after violent exercise in a gymnasium. The test-tubes were then given to a number of whites with instructions to rank them in order of pleasantness. The results showed no consistent preference for the white samples; the test-tubes considered most pleasant and most unpleasant were both taken from whites.

Cleanliness is of course an important factor in body odour. Where there is a high level of poverty in a particular racial group, where also this group lives largely in the warmer parts of a country and has a natural tendency to sweat profusely, and where emotions have been violent for many years, it is to be expected that accusations of this particular kind should arise. The answer is social and psychological. The taste for hot mankind in the mass is definitely an acquired one: but given the social grace of tolerance it is one that can be gained.

A MEDICAL MISSION TO CZECHOSLOVAKIA

THE Czechoslovak Government, in consultation with UNRRA, has organised a medical mission which will shortly be leaving London for liberated Czechoslovak territory. It will be led by Dr. J. Ungar, who has been working in this country on the scientific staff of Glaxo Laboratories. The 30 medical members, many of whom are specialists in health administration, will be assisted by a staff of trained nurses and social workers, and they will take enough hospital supplies to meet initial requirements. Their instructions are to follow as closely as possible upon the retreating enemy forces, surveying medical and nutritional needs and aiding in epidemiological control. The rapid organisation of this mission has been made possible by the British Government and local authorities having granted immediate leave to Czechoslovak medical personnel.

TYPHOID ABSCESS YEARS AFTER INFECTION

THE case reported by H. M. M. Woodward (*Lancet*, Sept. 9, 1944, p. 361), in which a typhoid abscess arose from a rib 6 years after the acute infection, is by no means a record. Dr. R. T. Cooke, of Preston, recalls that with Dr. P. Phillips he described a case of popliteal abscess, the pus from which gave *Bact. typhosum* in pure culture, in a man of 68 who had had typhoid fever at the age of 11 (*Brit. med. J.* 1937, i, 219). There was no evidence of a bony origin for that abscess. Cooke and Phillips cited other examples of long delays between infection and abscess, including one where a man had typhoid in the siege of Mafeking and developed a *Bact. typhosum* osteomyelitis of the femur after being kicked by a horse 24 years later.

Royal Medical Society of Edinburgh

On Oct. 13, Lord Moran will deliver the inaugural address of the 1944–45 session. He will speak on the anatomy of courage. During the session the following other addresses will be given: Sir Joseph Barcroft, FRS, problems in fœtal life (Oct. 27); Sir Alexander Fleming, FRS, penicillin (Nov. 10); Prof. J. H. Gaddum, the discovery of new remedies (Oct. 24); Sir John Orr, FRS, the future of medicine (Jan. 12); Lieut.-General Sir Alexander Hood, the Army medical services in peace and war (Jan. 26); Mr. Walter Elliot, MP, medicine and the state (Feb. 2); Colonel J. C. Kimbrough, USAMC, wound of the genito-urinary tract in modern warfare (Feb. 16). The addresses are given on Friday evenings at 7, Melbourne Place, Edinburgh.

Association of Clinical Pathologists

A meeting of the association will take place on Saturday, Sept. 30, at 11 AM, at the London School of Hygiene, Keppel Street, W.C.1. At 11 AM, Prof. A. A. Miles and Dr. Nancy Hayward will speak on the specificity of the Nagler reaction and the general problem of wound bacteriology, and Air-Commodore T. C. C. Morton will describe a case of eosinophilia. At 2 PM Sir Alexander Fleming, FRS, will speak on the laboratory control of penicillin therapy, and afterwards Lieut.-Colonel Yale Kneeland, USAMC, will discuss its use in the treatment of infectious diseases, Colonel D. M. Pillsbury, USAMC, its use in the treatment of venereal disease, and Lieut.-Colonel J. S. Jeffrey, RAMC, its use in the treatment of war wounds.

English New Education Fellowship

A meeting of the North West London branch will be held at 7.45 PM on Tuesday, Oct. 3, at the Hendon County School, Golders Rise, N.W.4, when Dr. S. W. Jeger and Dr. R. W. Cockshut will speak on schools and the state medical service.

University of London

Names lately added to the university's roll of honour include the following:

Staff

Wing-Commander D. S. BATEMAN, RAFVR (St. Thomas's)
Captain R. CLARKE, RAMC (St. Mary's)
Captain J. B. C. MURDOCH, RAMC (Guy's)
Surgeon Lieut. J. H. WAINWRIGHT, RNVR (Westminster)

Graduates

Surgeon Lieut. A. D. BONE, DSC, RNVR (St. Thomas's)
Captain J. S. G. A. BURNS, RAMC (King's)
Surgeon Commander A. E. P. CHEESEMAN, RN (Guy's)
Surgeon Commander A. W. COCKING, RN (Guy's)
Surgeon Lieut. M. C. CROSS, RNVR (Guy's)
Surgeon Lieut. C. M. DAVIES, RNVR (London)
Surgeon Lieut.-Commander C. H. EGAN, RN (Guy's)
Lieut.-Colonel C. C. G. GIBSON, RAMC (Guy's)
Surgeon Lieut. R. L. GREENFIELD, RN (Guy's)
Captain CALEB GREENWOOD-PENNY, RAMC (St. George's)
Surgeon Lieut.-Commander B. F. JACKSON, RNVR (Bart's)
Major H. M. R. KNIGHT, RAMC (Guy's)
Captain J. F. V. LART, RAMC (St. Thomas's)
Captain A. E. LOCKE, RAMC (Guy's)
Colonel D. LURIE, S. African MF (Guy's)
Surgeon Lieut. F. M. MCRAE, RNVR (St. Mary's)
Surgeon Lieut.-Commander LESLIE MERRILL, RN (Guy's)
Captain E. J. A. NEEDHAM, RAMC (Guy's)
Lieut. R. A. PALMER, RAMC (King's)
Lieut. ASHER PEARLMAN, RAMC (Univ. Coll.)
Flight-Lieut. W. S. PITT-PAYNE, RAFVR (Guy's)
Flying-Officer J. W. ROBB, RAFVR (Guy's)
Surgeon Lieut. E. R. ROSEVEARE, RNVR (Guy's)
Dr. ROBERT SOUTH, Merchant Navy (Guy's)
Surgeon Lieut. D. L. SANDES, RNVR (Bart's)
Major T. P. WARD, RAMC (St. Thomas's)
Flight-Lieut. C.F.H. WEISSNER, RAFVR (Middx)
Captain W. F. J. WESTON, RAMC (Guy's)

Chadwick Lectures

The following programme has been arranged for the autumn session: Lord Amulree, water-supplies in peace and war (Oct. 3, at 26, Portland Place, W.1); Mr. Somerville Hastings, the management of hospitals in peace and war (Oct. 31, London School of Hygiene, Keppel Street, W.C.1); Mr. G. H. Humphreys, M INST CE, modern trends in sanitary engineering (Nov. 14, 90, Buckingham Palace Road, S.W.1); Dr. J. A. H. Brincker, research for the promotion of health and the prevention of disease (Nov. 28, Westminster Hospital medical school, S.W.1); Mr. G. H. Walker, PH D, food and its adulteration during the present war (Dec. 12, 26, Portland Place, W.1). The lectures are all held on Tuesdays, at 2.30 PM. Further particulars from the secretary of the trust, 204, Abbey House, S.W.1.

Association of Industrial Medical Officers

The annual general meeting will take place at the London School of Hygiene, Keppel Street, W.C.1, on Saturday, Oct. 14, at 11 AM, and at 2.30 PM Prof. John Ryle will speak on social medicine as a discipline.

Faculty of Radiologists

The annual meeting has had to be curtailed and will now be held at the Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2, on Friday, Sept. 29, at 10 AM. At 2.30 PM there will be a discussion on the white-paper on a National Health Service.

Atmospheric Pollution

In view of the increasing public interest in atmospheric pollution in relation to postwar reconstruction, the Atmospheric Pollution Research Committee thinks it may be of value to local authorities and others to have a note of methods of making comparatively simple surveys of pollution, suitable for use when information is required quickly for guidance in town-planning or for other purposes. They have therefore prepared an account of rapid methods of measuring (1) deposited solid matter, (2) suspended solid matter, and (3) sulphur dioxide in the atmosphere. Copies have been circulated to the local authorities. The secretary of the committee may be addressed at the Department of Scientific and Industrial Research, Teddington, Middlesex.

Professor KUROCHKIN, of Astrakhan, has employed dressings soaked in a culture of the soil organism *Serratia marcescens*, or *B. prodigiosus*, in the treatment of frost-bite, extensive burns and septic wounds. The treatment is said to be successful and harmless to the patient.

Medical Film at Plymouth

A Ministry of Information medical film, Surgery of Chest Diseases, is being shown at the Odeon Cinema, Plymouth, on Sunday, Oct. 15, at 11 AM. Surgeon Rear-Admiral G. Gordon-Taylor is to give an address, and all medical practitioners will be welcome.

Royal Sanitary Institute

A meeting will be held at Haywards Heath on Saturday, Oct. 14. At 10.30 AM, at the Perrymount Cinema, Dr. W. B. Stott will open a discussion on diphtheria immunisation. Further information from Dr. Stott, Oaklands, Haywards Heath, Sussex.

Food Education Society

On Oct. 23, at 2.30 PM, at the London School of Hygiene, Keppel Street, W.C.1, Miss Rose Simmonds, dietitian at Hammersmith Hospital, will speak on food and the sick.

Biochemical Society

A meeting will be held in the department of biochemistry of the University of Sheffield on Friday, Sept. 29, at 11 AM.

Appointments

EVANS, G. C. D., MB WALES, DMR: radiotherapist to the Nottingham radium centre.
HENDERSON, BLANCHE, MB LOND.: asst. MOH for Plymouth.
Colonial Service.—The following appointments have been made:
GRIFFITHS, G. E., MB GLASG.: MO, Nigeria.
BIGGER, W. K., OBE, MC, BA CAMB., MRCS: DDMS, Palestine.
MACQUEEN, JOHN, MD EDIN., DPH: DMS, Palestine.
FRANCIS, A. G., MD NUI: MO (grade A), Trinidad.

Births, Marriages and Deaths

BIRTHS

COTMAN.—On Sept. 9, at Maidstone, the wife of Dr. J. S. Cotman—a son.
CRAIKE.—On Sept. 6, at Ealing, the wife of Dr. W. H. Craike, RAFVR—a daughter.
HANDLEY.—On Sept. 10, at Newcastle-on-Tyne, the wife of Lieut.-Colonel R. S. Handley, RAMC—a daughter.
HARGREAVES.—On Sept. 9, in London, the wife of Lieut.-Colonel G. R. Hargreaves, RAMC—a daughter.
JONES.—On Sept. 15, at Macclesfield, the wife of Mr. A. Norman Jones, FRCS—a son.
KENNEDY.—On Sept. 14, at Beaconsfield, Bucks, the wife of Surgeon-Lieutenant R. K. I. Kennedy, RNVR—twin sons.
MACDONALD.—On Sept. 10, at Barnt Green, near Birmingham, the wife of Major W. T. Macdonald, MC, RAMC—a daughter.
MCKISSOCK.—On Sept. 13, at Bath, the wife of Mr. Wylie McKissock, FRCS—a son.
MILLER.—On Sept. 14, at Glasgow, the wife of Major W. Naismith Miller, RAMC—a son.
MURRAY.—On Sept. 14, the wife of Dr. John Murray, Stoke Mandeville—a daughter.
PERKINS.—On Sept. 8, at Pembury, Kent, the wife of Dr. Christopher Perkins—a son.
QUINTON.—On Sept. 10, at Tonbridge, the wife of Captain John Quinton, RAMC—a son.
STRADLING.—On Sept. 10, at Berkhamsted, to Dr. Peggy Stradling (née Snow), wife of Dr. Peter Stradling—a daughter.
TROUP.—On Sept. 11, in London, the wife of Surgeon Lieutenant David Troup, RNVR—a daughter.

MARRIAGES

MORLEY—GREEN.—On Sept. 12, at Peterborough, George Henry Morley, OBE, FRCS, RAF, to Kathleen Joan Elizabeth Green.
WICKES—THOMSON.—On Sept. 9, at West Wittering, Sussex, Ian Goodson Wickes, surgeon lieutenant RNVR, to Monica F. Thomson.
WOODARD—MCMURRAY.—On Sept. 12, at Liverpool, Christopher Roy Woodard, surgeon lieutenant RNVR, to Dorothy Boden McMurray, WRNS.

DEATHS

BORE.—On Sept. 12, at Widecombe, Norah Helen Bore, BA LOND., MRCS.
FLEMING.—On Sept. 13, at Pirbright, Wilfrid Louis Remi Fleming, MRCS, JP.
MELSOME.—On Sept. 11, at Bath, William Stanley Melsome, MD CAMB., FRCS, formerly a fellow of Queens' College, Cambridge.
MARSH.—On Sept. 17, at Edgbaston, Birmingham, Frank Douglas Marsh, MC, MB CAMB., FRCS, aged 55.
ROSE.—On Sept. 16, Pattie Elizabeth Rose, MRCS, of Harlton, Cambs.
RUNDLE.—On Sept. 15, at Hove, Frank Carlyon Rundle, LRCPE.
SMITH.—On Sept. 17, at Criccieth, Lewis Smith, MD LOND., FRCP, aged 75.
STOCKEN.—On Sept. 12, Leslie Maury Stocken, MRCS, LDS.
TORNEY.—On Sept. 12, at Tunbridge Wells, Richard Hastings Swan Torney, MB RUI, formerly of Cowbridge, South Wales, aged 78.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

A LOGICAL DEFENCE AGAINST COMMON COLD

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(1944, Sixth Supplement)

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No. 4/0	6/0	No. 1	2, 3
No. 3/0	5/0, 4/0, 3/0	No. 2	4
No. 2/0	2/0, 0	No. 3	5
No. 0	1	No. 4	6, 7, 8

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In Liquor Carbonis Detergens the antiseptic and antipruritic agents in Coal Tar were isolated for the first time from the inert residuum of substances lacking therapeutic value, and the preparation has been used and recommended by skin specialists for over 80 years.

It naturally followed that Liquor Carbonis Detergens was included in the basic formula of Wright's Coal Tar Soap. This powerful antiseptic principle gave the soap a character and value exclusively its own without the slightest risk of harshness to the skin. Wright's, in fact, is specially soothing and particularly thorough in its cleansing.

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PRO INTEGRITATE CUTIS

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Allantoin-Sulphanilamide
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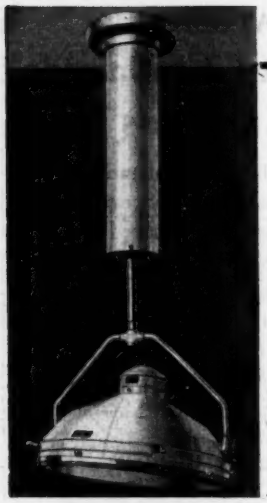

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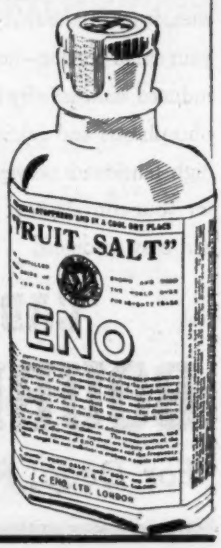

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For the reception and treatment of PRIVATE PATIENTS of both sexes of the UPPER AND MIDDLE CLASSES suffering from Mental and Nervous Disorders, Alcoholism and Drug Addiction, either voluntarily, temporarily, or under certificate. Patients are classified in separate buildings according to their mental condition. Situated in park and grounds of 400 acres. Self-supported by its own farm and gardens in which patients are encouraged to occupy themselves. Every facility for indoor and outdoor recreation. For terms, prospectus, etc., apply MEDICAL SUPERINTENDENT. *Telephone:* Ashton-in-Makerfield 7311. *Telegraphic Address:* Wootton, Ashton-in-Makerfield.

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A Private Mental Hospital, for Ladies and Gentlemen suffering from Nervous and Mental Illness, where the amenities of a comfortable home are combined with full investigation and every well-established modern treatment.

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This Registered Hospital is situated in 130 acres of park and pleasure grounds. Voluntary patients, who are suffering from incipient mental disorders or who wish to prevent recurrent attacks of mental trouble; temporary patients, and certified patients of both sexes are received for treatment. Careful clinical, bio-chemical, bacteriological, and pathological examinations. Private rooms with special nurses, male or female, in the Hospital or in one of the numerous villas in the grounds of the various branches can be provided.

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This is a Reception Hospital in detached grounds with a separate entrance, to which patients can be admitted. It is equipped with all the apparatus for the complete investigation and treatment of Mental and Nervous Disorders by the most modern methods: insulin treatment is available for suitable cases. It contains special departments for hydrotherapy by various methods, including Turkish and Russian baths, the prolonged immersion bath, Vichy Douche, Scotch Douche, Electrical baths, Plombieres treatment, etc. There is an Operating Theatre, a Dental Surgery, an X-Ray Room, an Ultra-violet Apparatus, and a Department for Diathermy and High-frequency treatment. It also contains Laboratories for bio-chemical, bacteriological, and pathological research. Psychotherapeutic treatment is employed when indicated.

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Two miles from the Main Hospital there are several branch establishments and villas situated in a park and farm of 650 acres. Milk, meat, fruit, and vegetables are supplied to the Hospital from the farm, gardens, and orchards of Moulton Park. Occupational therapy is a feature of this branch, and patients are given every facility for occupying themselves in farming, gardening, and fruit growing.

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For terms and further particulars apply to the Medical Superintendent (TELEPHONE: No. 2356 and 2357 Northampton), who can be seen in London by appointment.

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Applications, together with the fee of 1 guinea and 2s. 6d. if lunch is required on the Sunday, should be sent to the Secretary of the School, Keppel-street, Gower-street, London, W.C.1, before Monday, 23rd October.

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Cases of Alcoholism and Drug Addiction are admitted. Every facility for individual treatment on the most modern lines. As the Hospital is well endowed, terms are exceptionally moderate.

Medical Certificates given anywhere in the British Isles are valid for admission of patients.

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A Private Hospital for the Treatment and Care of Mental and Nervous Illnesses in both Sexes.

A modern country house, 12 miles from Marble Arch, in attractive and secluded surroundings. Fees from 10 guineas per week inclusive. Cases under Certificate, Voluntary and Temporary Patients received for treatment.

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Notice is hereby given that the Examination for the DIPLOMA IN CHILD HEALTH advertised to begin on Monday, 25th September, next, will, owing to present conditions in London, be postponed until—

MONDAY, 20TH NOVEMBER, next.

Candidates who had entered for the Examination have been personally notified of the change of date, and others who wish to do so may submit applications, in writing, to the Secretary, Examination Hall, Queen-square, London, W.C.1, not later than Monday, 30th October, accompanied by the certificates required by the regulations, and the amount of the fee due (£6 6s.).

HORACE H. REW,
Secretary, Examining Board in England.

LONDON COUNTY COUNCIL. Medical practitioners required for the undermentioned positions:—

(1) TEMPORARY ASSISTANT MEDICAL OFFICER, Class I (B1). Salary £350 a year, rising by £25 a year to £425 a year, plus temporary cost-of-living bonus.

Hospital	*Duties*
St. Olave's Hospital, Lower-road, Rotherhithe, S.E.16.	Mainly anæsthetics.
Mile End Hospital, Bancroft-road, Mile End, E.1.	Surgical.
St. Peter's Hospital, Fulbourne-street, Whitechapel, E.1.	General medical (chronic sick).

Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

(2) TEMPORARY ASSISTANT MEDICAL OFFICER, Class II (B2). Salary £250 a year, plus temporary cost-of-living bonus.

Hospital	*Duties*
St. Stephen's Hospital, 369, Fulham-road, S.W.10.	Fractures and casualty.
Hackney Hospital, High-street, Homerton, E.9.	Casualty Officer.
Dulwich Hospital, East Dulwich-grove, S.E.22.	Anæsthetics.
St. Giles' Hospital, St. Giles'-road, Camberwell, S.E.5 (2 vacancies).	(*a*) Medical and anæsthetics. (*b*) Medical.
St. Mary, Islington, Hospital, Highgate Hill, N.19.	Obstetrics.
Grove Park Hospital, Lee, S.E.12 (temporarily evacuated).	Experience in tuberculosis desirable.
Queen Mary's Hospital for Children, Carshalton, Surrey (2 vacancies).	(*a*) Medical. (*b*) Surgical.
Lambeth Hospital, Brook-drive, Kennington-road, S.E.11.	General medical.
Mile End Hospital, Bancroft-road, E.1.	General medical.

Infectious Hospitals Service: Persons appointed to the Infectious Hospitals Service are eligible for promotion to Class I (B1) (temporary rank) in that service after a minimum period of 6 months.

R and W practitioners who now hold A posts may apply, when appointment will be limited to 6 months.

The above positions are with board, lodging, and washing. Married quarters are not available.

Application forms obtainable (stamped addressed foolscap envelope required) from the Medical Officer of Health (S.D.2), The County Hall, S.E.1, returnable by 9th October, 1944. Canvassing disqualifies.

COUNTY BOROUGH OF EAST HAM. Applications are invited from duly qualified persons for the appointment of TEMPORARY ASSISTANT MEDICAL OFFICER OF HEALTH (Man or Woman) at a salary of £500, rising annually by £50 to a maximum of £700 p.a., plus war bonus in accordance with the Council's scale for official staff from time to time, at present £33 16s. p.a.

A salary above the commencing salary may be paid according to the experience of the candidate appointed. The age limit is 45 years.

The appointment will be subject to the approval of the Ministry of Health, the provisions of the Local Government Act, 1937, and to the Council's conditions of service applicable to the post in force from time to time.

The successful candidate will be required to act under the direction of the Medical Officer of Health, to undertake primarily duties in connexion with maternity and child welfare and the Aldersbrook Children's and Scattered Homes, together with such other work as may be allocated by the Medical Officer of Health from time to time.

The person appointed must devote whole-time service to the duties of the office, not engage in private practice, and must reside within the County Borough or in the vicinity of the Aldersbrook Children's Homes, Wanstead. The successful applicant will be required to pass a medical examination.

Persons of military age must obtain the permission of the Ministry of Health to apply for this position under the terms of the Ministry of Health Circular 2818 dated 26th May, 1943.

The appointment will be subject to 1 month's notice on either side.

Forms of application can be obtained from the undersigned and must be returned, together with copies of 3 recent testimonials and endorsed "Assistant Medical Officer," not later than the 12th October, 1944.

Canvassing in any form will disqualify.

C. V. THORNLEY, Town Clerk.

Town Hall, East Ham, E.6, September, 1944.

THE ROYAL NATIONAL THROAT, NOSE, AND EAR HOSPITAL, Gray's Inn-road, W.C.1, and Golden-square, W.1. ASSISTANTS in the Out-patient Department. There are vacancies at Golden Square Hospital for attendance on Mondays, Tuesdays, and Fridays at 2 P.M. The posts, which are honorary ones, afford excellent opportunities of acquiring an extended knowledge of the specialty, as the duties consist of assisting the Surgeons in seeing the patients.

Applications, which may be for periods of 3, 6, or 12 months, should state the day for which they are made and should be sent as soon as possible to—

JOHN H. YOUNG, Secretary-Superintendent.

BRITISH POSTGRADUATE MEDICAL SCHOOL. (University OF LONDON.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), vacant 1st November, 1944. The appointment is for 6 months. The salary is at the rate of £105 p.a., plus full residential emoluments. Practitioners liable to service under the National Service Acts and who have not yet completed 3 months since date of qualification may apply.

Apply the Dean, British Postgraduate Medical School, Ducane-road, W.12, before October 10th, 1944.

LONDON CHEST HOSPITAL, Victoria Park, E.2. Applications are invited for the appointment of HOUSE PHYSICIAN (B2) (Male or Female), required on 1st November. 6 months' appointment. Salary at the rate of £150 p.a. Board, residence, and laundry provided. R and W practitioners holding A posts may apply.

Applications, with copies of 3 recent testimonials, should be sent at once to the Secretary.

THE SOUTH LONDON HOSPITAL FOR WOMEN, Clapham Common, S.W.4. Applications are invited from registered medical Female practitioners for the undermentioned appointment, vacant 1st November: HOUSE SURGEON (A). The appointment will be for a period of 6 months. Salary is at the rate of £100 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply.

Applications, stating age, nationality, qualifications with dates, and accompanied by copies of 3 recent testimonials, should be sent to the Secretary at the hospital by Saturday, 14th October, 1944.

CONNAUGHT HOSPITAL, Walthamstow, E.17. Applications are invited from registered medical practitioners, Male and Female, for the appointment of CASUALTY OFFICER (A), vacant 1st October, 1944. Salary at the rate of £120 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications to be sent as soon as possible to—

R. HALTON HARRISON, Secretary.

WEIR HOSPITAL, Weir-road, Balham, S.W.12. Applications are invited from registered medical practitioners for the appointment of RESIDENT HOUSE SURGEON (B2), vacant now. Salary is at the rate of £200 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to 6 months.

Applications should be sent to the Honorary Secretary-Superintendent.

LONDON CHEST HOSPITAL, Victoria Park, E.2. House SURGEON (B2), Male or Female, required on 1st November, with previous surgical experience, preferably thoracic. Salary £150 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to 6 months.

Applications should be sent at once to the Secretary.

THE SALVATION ARMY. The Mothers' Hospital, Clapton, E.5. Applications are invited from medical Women for the post of JUNIOR RESIDENT MEDICAL OFFICER (B2), vacant 1st November. Salary £110 p.a., with board, residence, and laundry. The appointment is for 6 months. W practitioners who now hold A posts may also apply.

Applications, with testimonials, to be sent to the Secretary-Superintendent not later than 9th October.

THE SALVATION ARMY. The Mothers' Hospital, Clapton, E.5. Applications are invited from medical Women for the post of SENIOR RESIDENT MEDICAL OFFICER (B2), vacant 1st November. Salary £150 p.a., with board, residence, and laundry. The appointment is for 6 months. W practitioners holding A posts may apply.

Applications, with testimonials, to be sent to the Secretary-Superintendent not later than 9th October.

CHARING CROSS HOSPITAL. Resident Medical Officer. Applications are invited from registered medical practitioners (Male) for the above B1 appointment. Minimum commencing salary £350 p.a. Suitably qualified R practitioners holding B2 appointments are invited to apply. Those holding B1 appointments can only be considered if they have been rejected by the R.A.M.C.

Applications, together with copies of 3 testimonials, should be sent to arrive not later than first post Monday, 2nd October, to: GEORGE J. JONES, Secretary, Charing Cross Hospital, London, W.C.2.

METROPOLITAN HOSPITAL, Kingsland-road, London, E.8. Applications are invited from registered medical practitioners (Male) for the appointments of HOUSE SURGEON (A) and HOUSE PHYSICIAN (A). Salary in each case is at the rate of £150 p.a., with full residential emoluments. Appointments will be for a period of 6 months. Practitioners within 3 months of qualification and liable under National Service Acts may apply.

Applications should be addressed to—

FRANK JENNINGS, House Governor and Secretary.

WOOLWICH MEMORIAL HOSPITAL, Shooters Hill, London, S.E.18. CLINICAL ASSISTANTS required: (*a*) Wednesday mornings, and (*b*) Friday afternoons, to assist Dr. Bruce Pearson. Honorarium 1 guinea per session.

Applications, for one or both sessions, should be addressed to the Honorary Secretary, Medical Committee, at the Hospital.

MIDDLESEX COUNTY COUNCIL. Resident Casualty Officer (B2) required at Hillingdon County Hospital, near Uxbridge, Middlesex. Applications invited from registered medical practitioners who have held house appointments and had good all-round experience (including R practitioners who now hold A posts). Salary £350 p.a., plus cost-of-living bonus. Board, lodging, and laundry. Whole-time duties, under Medical Director, will include dealing with casualties and admissions to Hospital, and such other duties as may be required. Appointment is primarily for 6 months, with possibility of extension to 12 months (except in case of R practitioners). Post vacant early October.

Applications, stating age, nationality, qualifications, present post, and previous experience, and enclosing copies of not more than 3 recent testimonials, to be made to the Medical Director of Hospital, "B3." Application forms not provided. Closing date 30th September, 1944.

C. W. RADCLIFFE, Clerk of the County Council.

Middlesex Guildhall, Westminster, S.W.1.

Post not open to W practitioners, as there is no accommodation at Hospital for women doctors.

MIDDLESEX COUNTY COUNCIL. Springfield Mental Hospital, London, S.W.17. Temporary Male British ASSISTANT MEDICAL OFFICER (B1), unestablished, required at the above Mental Hospital. Salary £400 p.a., plus current war bonus £25 p.a. and full residential emoluments. Previous mental experience not essential. Suitably qualified R practitioners holding B2 appointments, also those now holding B1 and who have been rejected by the R.A.M.C., may apply.

Applications, stating age, qualifications, and experience, together with copies of testimonials, should be sent at once to the Medical Superintendent.

KING EDWARD MEMORIAL HOSPITAL, Ealing, W.13. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant the 29th October, 1944. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary at the rate of £350 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications with dates, experience and details of previous appointments, and accompanied by copies of 2 recent testimonials, should be sent immediately to: R. A. MICKELWRIGHT, House Governor.

GUY'S HOSPITAL. Applications are invited for the post of CHIEF CLINICAL ASSISTANT (Refractionist) in the Ophthalmological Out-patient Department, for attendance on Thursday afternoons. Honorarium at the rate of £2 2s. per session. Suitably qualified R practitioners holding B2 posts, also those now holding B1 and have been rejected by the R.A.M.C., may apply.

Applications should be sent to the Superintendent, Guy's Hospital, London Bridge, S.E.1, on or before 7th October, 1944.

METROPOLITAN BOROUGH OF BERMONDSEY. Applications are invited from registered medical practitioners for part-time work in the Physiotherapeutic Department of the Public Health Centre. Salary as approved scale. Applicants must have experience in physiotherapy.

Further details will be supplied by the Medical Officer of Health, Municipal Offices, Spa-road, S.E.16, on request.

S. E. FREEMAN, Town Clerk.

Municipal Offices, Spa-road, Bermondsey, S.E.16,
12th September, 1944.

ROYAL BERKSHIRE HOSPITAL, Reading. The Board of Management invites applications for the appointment of HONORARY PHYSICIAN. Candidates must be medical graduates of one of the universities of the British Empire and their names entered on the Medical Register. The appointment is temporary and is terminable within 12 months of the conclusion of hostilities. The elected candidate will be appointed for a period ending on the third Tuesday in January, 1945, and will be eligible for re-election. Canvassing on the part of a candidate or on his behalf will disqualify him.

Candidates are required to provide 6 copies of their application and testimonials, which must be addressed to the Secretary and reach him not later than 9 A.M. on Saturday, 21st October, 1944.

No testimonials will be required from candidates who are members of the existing Medical Staff.

The election will be held on the 7th November, 1944.

By Order, H. E. RYAN, Secretary and House Governor.

THE WEST RIDING OF YORKSHIRE HOSPITALS BOARD. HIGHROYDS EMERGENCY HOSPITAL. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant immediately. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £350 p.a., together with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and have been rejected by the R.A.M.C., may apply.

Applications, stating age, qualifications, and experience, together with the names and addresses of 2 persons to whom reference may be made, to be forwarded immediately to the Medical Superintendent, Highroyds Emergency Hospital, Menston, near Leeds.

There is no printed form of application.

G. L. BANNER, Clerk of the Board.

Board Offices, Wakefield, September, 1944.

COUNTY BOROUGH OF STOCKPORT. Stepping Hill Hospital. (450 Beds.) Applications are invited from duly qualified medical practitioners for 2 posts of RESIDENT ASSISTANT MEDICAL OFFICERS (B2) (Male or Female) at the above Hospital. Determinable by 1 month's notice on either side. Salary £350 p.a. (plus cost-of-living bonus), with board, residence, and laundry. The person appointed will be required to devote the whole of his/her time to the duties of the office. R and W practitioners holding A posts may also apply, when appointments will be limited to 6 months; otherwise not to exceed 1 year.

Applications, stating age, qualifications, and experience, together with copies of 3 testimonials, are to be sent, endorsed "Assistant Medical Officer."

J. YULE, M.D., Medical Officer of Health.

Town Hall, Stockport, September, 1944.

ROYAL SOUTH HANTS AND SOUTHAMPTON HOSPITAL. (255 Beds.) Applications are invited from registered medical practitioners, Male and Female, including R and W practitioners who now hold A posts, for the appointment of HOUSE SURGEON (B2), vacant 29th October, 1944. The appointment will be for a period of 6 months. The salary is at the rate of £175 p.a., with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent immediately to—

EDWARD L. WIBGMAN, House Governor and Secretary.

COUNTY BOROUGH OF IPSWICH. Assistant Medical Officer OF HEALTH. Applications are invited from registered medical practitioners for the above whole-time temporary appointment, probably for the duration of the war. The possession of the Diploma in Public Health or an equivalent qualification will be an advantage. The salary scale is £600 p.a., rising by annual increments of £25 to £700, plus war bonus and travelling expenses. The successful candidate will be required to devote the whole of his or her time to the duties of the office, to assist generally as directed by the Medical Officer of Health in the administration of the various health services of the Council. The approval of the Minister of Health has been obtained for the appointment, and candidates should submit with their applications full information as to their liability for military service, medical fitness, and position as regards deferment.

Applications, accompanied by not more than 3 recent testimonials and endorsed "Assistant Medical Officer of Health," should be forwarded to the Medical Officer of Health, Elm-street, Ipswich, at once.

Town Hall, Ipswich. A. MOFFAT, Town Clerk.

CITY OF SHEFFIELD. Lodge Moor Hospital for Infectious DISEASES AND E.M.S. HOSPITAL, SHEFFIELD. Applications are invited from registered medical practitioners, Male or Female, including R and W practitioners who now hold A posts, for the position of RESIDENT ASSISTANT MEDICAL OFFICER (B2), at Lodge Moor Hospital for Infectious Diseases and E.M.S. Hospital, Sheffield. Salary £300 p.a., plus war bonus, with full residential emoluments. The appointment will be limited to 6 months for R or W practitioners; otherwise for 1 year, subject to 1 month's notice on either side.

Applications, stating age, qualifications, nationality, and when at liberty, with 2 copies of recent testimonials, should be sent immediately to the Medical Superintendent, Lodge Moor Hospital, Sheffield, 10.

STRATFORD-ON-AVON EMERGENCY HOSPITAL. County of WARWICK. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant shortly. Applicants should have held house appointments and had surgical experience. Salary is at the rate of £300 p.a., with full residential emoluments. The appointment is limited to a period of 1 year. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and have been rejected by the R.A.M.C., may apply.

Applications, on forms to be obtained from the Public Assistance Officer, Shire Hall, Warwick, should, on completion, be returned to him not later than the 13th October, 1944.

MANCHESTER ROYAL INFIRMARY. 2 House Surgeons (A) to Orthopædic Department. The Board of Management invite applications for the above posts, vacant shortly, from registered medical practitioners, Male and Female, including practitioners within 3 months of qualification and liable under the National Service Acts. The appointments are for 6 months at salaries at the rate of £75 p.a., with residence.

Applications, stating age, nationality, and qualifications, with 3 testimonials, should be sent to the Chairman of the Medical Board not later than 14th October, 1944.

By Order,
F. J. CABLE, General Superintendent and Secretary.

16th September, 1944.

THE ROBERT JONES AND AGNES HUNT ORTHOPÆDIC HOSPITAL, OSWESTRY. (540 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of ASSISTANT RESIDENT SURGICAL OFFICER (B1), vacant 30th September. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £350 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications, &c., with copies of recent testimonials, to be forwarded at once to the Secretary-Superintendent.

LANCASHIRE COUNTY COUNCIL. Public Health Committee. COUNTY HOSPITAL, WHISTON, near LIVERPOOL. Applications are invited from registered medical practitioners for the appointment of RESIDENT MEDICAL OFFICER (B1). Surgical experience will be an advantage. Salary is at the rate of £350 p.a., together with the usual residential emoluments. The appointment is subject to medical examination and is superannuable. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and have been rejected by the R.A.M.C., may apply.

Forms of application from the County Medical Officer of Health, Hospital and Medical Department, County Offices, Preston, to whom all applications must be forwarded, to arrive not later than Friday, 6th October, 1944.

GEORGE ETHERTON, Clerk of the County Council.

County Offices, Preston, 15th September, 1944.

THE BOLTON ROYAL INFIRMARY. The Committee of the Bolton Royal Infirmary invite applications from medical practitioners for the post of TEMPORARY HONORARY ASSISTANT PHYSICIAN to the Infirmary. In accordance with the B.M.A. rule this appointment will in the first place be for the duration of the war.

Applications, addressed to the undersigned, should be delivered not later than Monday, 2nd October, 1944.

JOSEPH GRIFFITH, Superintendent-Secretary.

MANCHESTER NORTHERN HOSPITAL. (General—113 Beds.) The Committee of Management invite applications from qualified medical practitioners for the post of MEDICAL REGISTRAR to the Out-patient Children's Clinic. Duties will consist of attending the Honorary Medical Staff on Tuesday and Friday mornings each week, at a fee of £1 1s. per session.

Applications to be sent to the Secretary, Mr. J. C. DANIELS, 38, Barton-arcade, Manchester, 3, as soon as possible.

COUNTY COUNCIL OF ESSEX AND URBAN DISTRICT COUNCIL OF THURROCK. COMBINED MEDICAL SERVICE. Applications are invited from duly qualified medical practitioners, possessing the Diploma in Public Health and having special experience in obstetrics, for the vacant joint appointment of TEMPORARY ASSISTANT COUNTY MEDICAL OFFICER AND TEMPORARY ASSISTANT MEDICAL OFFICER OF HEALTH.

The salary attaching to the appointment will be at the rate of £500 a year, together with war bonus, rising, subject to satisfactory service, by annual increments of £25 to £700 a year, but the commencing salary may be varied having regard to experience and capabilities.

Forms of application may be obtained from the Clerk of the County Council, to whom they should be returned completed, accompanied by copies of 3 recent testimonials, not later than 10th October, 1944.

Canvassing, whether directly or indirectly, is forbidden.

JOHN E. LIGHTBURN,
Clerk of the County Council.

A. E. POOLE,
Clerk to the Urban District Council of Thurrock.

County Hall, Chelmsford, 12th September, 1944.

ROYAL LANCASTER INFIRMARY, Lancaster. (311 Beds.) (Hospital recognised by the Royal College of Surgeons (England) for 2 Senior Posts.) Applications are invited from registered medical practitioners, Male and Female, for the following posts, vacant on dates stated :—

(1) SECOND HOUSE SURGEON (B2), Obstetrics and Gynæcology. Salary £175 p.a. Vacant 1st November. R and W practitioners holding A posts may apply, when the appointment will be limited to 6 months ; otherwise it may be extended.

(2) JUNIOR HOUSE SURGEON (A). Salary £130 p.a. Vacant 11th October. Practitioners within 3 months of qualification and liable under the National Service Acts may apply. The appointment will be limited to 6 months.

In both cases full residential emoluments are included.

Applications should be sent to—

C. H. GRIMSHAW, Superintendent-Secretary.

NORTH STAFFORDSHIRE ROYAL INFIRMARY, Stoke-on-TRENT. Applications are invited from registered medical practitioners for the appointment of ORTHOPÆDIC HOUSE SURGEON (A). Salary at the rate of £185 p.a., with full residential emoluments. The post offers exceptional experience in traumatic surgery. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for 6 months.

Applications to be forwarded as soon as possible to the House Governor.

COUNTY BOROUGH OF MIDDLESBROUGH. Public Health DEPARTMENT. HEMLINGTON EMERGENCY HOSPITAL. Applications are invited from registered medical practitioners for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2) at the above Hospital (480 Beds). Good experience is afforded in both medical and surgical work. The salary is at the rate of £200 p.a., together with full residential emoluments. The successful candidate will be required to pass satisfactorily a medical examination. R and W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months ; otherwise for a period of 12 months.

Applications to be sent to the Medical Officer of Health, Public Health Department, Municipal Buildings, Middlesbrough, not later than Tuesday, 3rd October, 1944.

PRESTON KITCHEN, Town Clerk.

Municipal Buildings, Middlesbrough, 12th September, 1944.

COUNTY BOROUGH OF DEWSBURY. The Council, with approval of the Minister of Health, invite applications from registered medical practitioners holding a Diploma in Public Health for the vacancy of TEMPORARY DEPUTY MEDICAL OFFICER OF HEALTH AND DEPUTY SCHOOL MEDICAL OFFICER. Salary £700, plus bonus (Male £49 8s., female £40 6s.).

Terms and conditions of the appointment, together with application form, may be obtained from the Medical Officer of Health, Municipal Buildings, Halifax-road, Dewsbury, to whom applications, accompanied by copies of 3 recent testimonials, should be delivered as soon as possible. The appointment will be subject to the approval of the Minister of Health and the provisions of the Local Government Superannuation Act, 1937. It will be terminated by 3 months' notice on either side. The person appointed will be required to reside in the County Borough. HOLLAND BOOTH, Town Clerk.

THE BOLTON ROYAL INFIRMARY. (270 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (B2), vacant 11th October, 1944. Salary £200 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to 6 months.

Applications, stating age, nationality, and experience, together with copies of testimonials, to be forwarded to—

JOSEPH GRIFFITH, Superintendent-Secretary.

GRIMSBY AND DISTRICT GENERAL HOSPITAL. (237 Beds.) Applications are invited from registered medicalp ractitioners, Male or Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the post of RESIDENT CASUALTY OFFICER AND HOUSE SURGEON (A). Appointment for 6 months. Salary at the rate of £175 p.a., with full residential emoluments.

Applications, stating age, nationality, qualifications, and copies of recent testimonials, to the Secretary-Superintendent.

NEWARK TOWN AND DISTRICT HOSPITAL. (70 Normal Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply. Appointment will be for a period of 6 months.

B. C. DION, Secretary-Superintendent.

THE RADCLIFFE INFIRMARY, Oxford. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A) to the Accident Department, vacant 1st November, 1944. The appointment is for a period of 6 months. Salary is at the rate of £100 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications, stating age, qualifications with dates, and nationality, with copies of testimonials, must be sent not later than Monday, 2nd October, to—

A. G. E. SANCTUARY, Administrator.

PONTEFRACT GENERAL INFIRMARY AND THE HYDES HOS-PITAL. (112 Beds.) Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE SURGEON (A), vacant immediately. Salary £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications should be sent to— D. J. RICHARDS,
11th September, 1944. Secretary-Superintendent.

CARDIFF ROYAL INFIRMARY. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant 31st October, 1944. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £300 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and have been rejected by the R.A.M.C., may apply.

Applications should be sent to—

R. ARMSTRONG, Medical Superintendent.

GENERAL HOSPITAL, Nottingham. (794 Beds, including E.M.S. Beds.) SECOND PATHOLOGIST (whole time) required, experienced in histology and morbid anatomy. Temporary appointment with possibility of confirmation after the war. Commencing salary £600 p.a.

Apply, with copies of testimonials, giving details of experience and qualifications, to House Governor and Secretary, General Hospital, Nottingham.

NORTHAMPTON GENERAL HOSPITAL. (408 Beds.) Applica-tions are invited immediately from registered medical practitioners, Male and Female, for the appointments of HOUSE PHYSICIAN (A), HOUSE SURGEON (A), and RESIDENT ANÆSTHETIST (B2). Salary for the A posts at rate of £150 p.a., and for the B2 post at rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply for the A posts, when appointments will be for a period of 6 months. R and W practitioners holding A posts may apply for the B2 post, when appointment will be limited to 6 months.

Applications should be sent as soon as possible to—

GORDON S. STURTRIDGE.

HARROGATE AND DISTRICT GENERAL AND E.M.S. HOS-PITAL. (420 Beds.) (Recognised by the R.C.S. for final F.R.C.S. examination requirements.) Applications are invited from registered medical practitioners for the post of HOUSE SURGEON (B1), appointment vacant 25th October, 1944. Applicants should have held house appointments and had surgical experience. Salary is at the rate of £250 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and have been rejected by the R.A.M.C., may apply.

Applications to the Secretary as soon as possible.

THE HOLY CROSS SANATORIUM, Haslemere, Surrey. (143 Beds, including private patients.) ASSISTANT RESIDENT MEDICAL OFFICER (B2), Female, required immediately. Experience in tuberculosis desirable. Salary £250 p.a., with full residential emoluments.

Applications, with copies of testimonials, should be sent to the Medical Superintendent immediately.

THE ROYAL INFIRMARY, Sunderland. (252 Beds in active use.) Applications are invited from registered medical practitioners, Male or Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment, now vacant, of CASUALTY OFFICER AND HOUSE SURGEON (A) to the Ear, Nose, and Throat Department for a period of 6 months. This post is recognised for the D.L.O. The salary is at the rate of £150 p.a., with full residential emoluments. M. J. HUNTLEY, House Governor and Secretary.

THE ROYAL PORTSMOUTH HOSPITAL, Portsmouth. Appli-cations are invited from registered medical practitioners (Male) for the appointment of CASUALTY OFFICER (A). 6 months' appointment. Salary £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications, stating age, qualifications, nationality, and copies of testimonials, to be sent to: B. WAGSTAFF, Secretary.

EXMINSTER HOSPITAL, Devon. Applications are invited from registered medical practitioners, Male and Female, for the following appointment. It is desirable that candidates should be interested in Orthopædic work, as Exminster Hospital is a Fracture A Hospital and has 220 fracture and orthopædic Beds :—

RESIDENT HOUSE SURGEON (B2). The salary is at the rate of £200 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to 6 months, otherwise can be for a period of 1 year.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be sent as soon as possible to the Medical Superintendent, Exminster Hospital, Exminster, near Exeter, Devon.

BOROUGH OF MANSFIELD. Applications are invited from registered Male or Female medical practitioners for the temporary post of DEPUTY MEDICAL OFFICER OF HEALTH AND DEPUTY SCHOOL MEDICAL OFFICER. Applicants must possess the Diploma in Public Health or an equivalent qualification in State Medicine, and should have experience in school medical work, maternity and child welfare, and infectious diseases. Experience in intelligence testing and in bacteriological work is also desirable. The vacancy is occasioned by the resignation of the present Deputy Medical Officer, who has obtained another post, but the appointment will be temporary in accordance with the desires of the Ministry of Health. The appointment will be subject to the approval of the Ministry of Health and the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to act under the direction of the Medical Officer of Health, to undertake the ordinary duties of Deputy Medical Officer of Health and Deputy School Medical Officer, to act as Deputy Superintendent of the Corporation's Infectious Diseases Hospital, and to perform any duties that the Council or any Committee thereof may from time to time deem necessary. The person appointed will be required to pass a medical examination, to devote the whole of his or her time to the duties of the appointment, and to reside within the Borough. Persons of military age must obtain permission of the Ministry of Health to apply for this position, under the terms of Circular 2818, dated 26th May, 1943; they must also submit with their application full information as to their liability for military service, medical fitness, and position as regards deferment. The salary will be at the rate of £700 p.a., plus war bonus (present amount £49 8s. p.a. male, £40 6s. p.a. female), and car allowance according to the Council's scale. Canvassing, either directly or indirectly, will be regarded as a disqualification.

Applications (on prescribed forms to be obtained at my office), accompanied by copies of 3 recent testimonials and endorsed "Deputy Medical Officer of Health," must be returned to me not later than Monday, the 2nd October, 1944.

A. C. SHEPHERD, Town Clerk.

Town Clerk's Office, Carr Bank, Mansfield,
4th September, 1944.

YORK COUNTY HOSPITAL. (222 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment as HOUSE SURGEON (A), vacant 24th October, 1944, whose main duties are in the Eye, Ear, Nose, and Throat Department (37 Beds, with busy Out-patient Clinics), but who will share in the general work of the Hospital, also Casualty duty. Salary is at the rate of £175 p.a., with full residential emoluments. This post is recognised for D.O.M.S. examination. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications to be sent immediately to—

J. R. MACKRILL, Secretary.

YORK COUNTY HOSPITAL. (222 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of an ORTHOPÆDIC HOUSE SURGEON AND CASUALTY OFFICER (B2), vacant 21st October, 1944. The salary is at the rate of £175 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Applications to be sent immediately to—

J. R. MACKRILL, Secretary.

CITY OF MANCHESTER. Booth Hall General Hospital for CHILDREN. (760 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant now, at the above-mentioned Class I E.M.S. Hospital. The appointment will be temporary for the duration of the war. Candidates must have practical surgical experience and, preferably, hold a high surgical qualification. Basic salary, in accordance with the Manchester Corporation conditions of service, commences at £475 p.a. and rises by annual increments of £25 to a maximum of £550, with full residential emoluments in addition. The salary is subject to a temporary cost-of-living wages addition. The commencing cash remuneration, at present, is £499 14s. Suitably qualified R and W practitioners holding B2 appointments, also those now holding B1 and rejected by the R.A.M.C., may apply.

Forms of application can be obtained from the Medical Officer of Health, Hospitals Administration Section, G.P.O. Box 399, Town Hall, Manchester, 2, and all applications must be received by him not later than 7th October, 1944. (Full details of the post can be obtained from the Medical Superintendent of Booth Hall Hospital, Blackley, Manchester, 9.) Canvassing in any form is prohibited. R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 7th September, 1944.

CITY OF MANCHESTER. Withington Hospital. (1150 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of TEMPORARY RESIDENT ASSISTANT MEDICAL OFFICER (B1) to the Tuberculosis Wards, vacant now. Candidates should have had experience in the treatment of pulmonary tuberculosis. The appointment will be temporary for the duration of the war. Salary £350 p.a., rising by annual increments of £25 to £450, with board, residence, and laundry valued at £85 in addition, subject to the Manchester Corporation conditions of service. A temporary cost-of-living wages addition is payable in addition to the salary stated. Suitably qualified R and W practitioners holding B2 appointments, also those now holding B1 and rejected by the R.A.M.C., may apply.

Full information and forms of application may be obtained from the Medical Officer of Health, Hospitals Administration Section, G.P.O. Box 399, Town Hall, Manchester, 2, and applications for the post must be received by him not later than 3rd October, 1944. Canvassing in any form is prohibited.

R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 7th September, 1944.

HUDDERSFIELD ROYAL INFIRMARY. (321 Beds.) Resident ANÆSTHETIST AND ASSISTANT CASUALTY OFFICER (A), required to commence shortly. Salary at the rate of £150, with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications should be sent as soon as possible to—

H. J. JOHNSON, General Superintendent and Secretary.

HUDDERSFIELD ROYAL INFIRMARY. (321 Beds.) House SURGEON (A), required to commence 19th October, 1944. Salary at the rate of £150, with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, together with testimonials, should be sent as soon as possible to—

H. J. JOHNSON, General Superintendent and Secretary.

ROYAL INFIRMARY, Preston. Applications are invited from registered medical practitioners (including practitioners within 3 months of qualification and liable under the National Service Acts) for the following posts:—

HOUSE SURGEON (A) to Consulting Surgeon (recognised for the F.R.C.S. examination).

HOUSE SURGEON (A) to Ophthalmic and Aural Departments with some duties in medical wards (recognised for the D.O.M.S. and D.L.O. examinations).

Salary in each case at the rate of £150 p.a., with full residential emoluments. 6 months' appointment.

Applications, with full details, to be sent to the Superintendent.

ROYAL INFIRMARY, Preston. Applications are invited for the temporary post of CONSULTANT OBSTETRICAL OFFICER (during the absence on military service of the permanent holder) for the Joint Scheme of Maternity Services. Duties—at the maternity hospitals belonging to the Infirmary, and the Preston Corporation, and also the antenatal clinics of the Lancashire County Council—to commence 1st October next. Candidates should hold a postgraduate degree in obstetrics. Salary at the rate of £1000 a year, plus travelling expenses.

Applications, stating age, qualifications, and experience, accompanied by copies of 3 testimonials, to be forwarded to: JOHN GIBSON, Superintendent and Secretary, at the Royal Infirmary, Preston, by the 18th September, 1944.

COVENTRY AND WARWICKSHIRE HOSPITAL. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). The post, which is for 6 months, is vacant immediately. Salary at the rate of £170 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be addressed immediately to—

S. CECIL HILL, House Governor and Secretary.

COVENTRY AND WARWICKSHIRE HOSPITAL, Coventry. The present holder of the post having suddenly been recalled for his country's service, applications are invited for the appointment of RESIDENT SURGICAL OFFICER (B1). Commencing salary £500 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating full details of qualifications and experience, &c., should be sent immediately to the House Governor.

ROCHDALE INFIRMARY, Lancs. (110 Beds.) The Board of Management invites applications from registered medical practitioners for the appointment of SECOND HOUSE SURGEON (A). Salary £150, with full residential emoluments. The successful candidate must be a member of a Medical Defence Society. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications to: W. WYNNE, Superintendent and Secretary.

YORK MATERNITY HOSPITAL. Applications are invited from registered Female practitioners, including W practitioners who now hold A posts, for the appointment of OBSTETRIC HOUSE SURGEON (B2), vacant 1st November. There is a Senior Medical Officer in charge. Duties will consist of work at the Maternity Hospital, attendance at clinics, and such other duties as may be prescribed by the Medical Officer of Health. The appointment will be for 6 months and is subject to the Council's Sick Allowance Regulations. Salary at the rate of £200 p.a., with full residential emoluments. A war bonus of 7s. 9d. per week is also paid.

Applications, with testimonials, should reach the undersigned not later than 30th September. C. B. CRANE, M.B., D.P.H.,
Acting Medical Officer of Health.

Health Department, 50, Bootham, York.

CHESTERFIELD AND NORTH DERBYSHIRE ROYAL HOSPITAL, CHESTERFIELD. Applications are invited from registered medical practitioners for the appointment of HOUSE PHYSICIAN (A), vacant 1st October, 1944. Appointment will be for 6 months. Salary £165 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications to—

M. H. BOONE, House Governor and Secretary.

UPTON EMERGENCY HOSPITAL, Chester. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (B2). The salary is at the rate of £200 p.a., with full residential emoluments. R and W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months, otherwise not exceeding 1 year.

Applications should be addressed to the Medical Superintendent, Upton Emergency Hospital, Chester.

9th September, 1944.

NOTTINGHAM GENERAL HOSPITAL. (712 Beds, including E.M.S. Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), duties to commence on or about 1st November. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications to be addressed to the undersigned, stating age, qualifications, experience, &c., together with copies of testimonials.

HENRY M. STANLEY,
House Governor and Secretary.

NOTTINGHAM GENERAL HOSPITAL. (712 Beds, including E.M.S. Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), duties to commence on or about 11th November. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications to be addressed to the undersigned, stating age, qualifications, experience, &c., together with copies of testimonials.

HENRY M. STANLEY,
House Governor and Secretary.

NOTTINGHAM GENERAL HOSPITAL. Applications are invited from registered medical practitioners (Male and Female) for the appointment of RESIDENT CASUALTY OFFICER (A) for the above Hospital. Duties to commence on or about 23rd October, 1944. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, stating age, qualifications and experience, together with copies of testimonials, to be sent to—

HENRY M. STANLEY, House Governor and Secretary.

GENERAL HOSPITAL, Nottingham. Ear, Nose, and Throat Department (40 Beds) and large Out-patient Department. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A) for the above Department. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications to be addressed to the undersigned, stating age, qualifications, experience, &c., together with copies of testimonials.

16th August, 1944. HENRY M. STANLEY, House Governor and Secretary.

ROYAL WEST SUSSEX HOSPITAL, Chichester. Applications are invited from registered medical practitioners for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (A). Appointment is for 6 months from date of appointment. Salary £150 p.a., with residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications, stating age, qualifications with dates, and nationality, supported by copies of 3 recent testimonials, should be sent to the House Governor and Secretary.

VICTORIA HOSPITAL, Burnley. (169 Beds.) Applications are invited from registered medical practitioners for the appointment of 2 HOUSE SURGEONS (A). Salary at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of 6 months.

Applications should be sent to : J. E. WHEATCROFT, Secretary.

THE ROYAL EYE AND EAR HOSPITAL, Bradford. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (B2). The salary is at the rate of £180 p.a., including full residential emoluments. R and W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months ; otherwise may be extended.

Applications, stating age, qualifications, nationality, and copies of 3 recent testimonials, should be forwarded to—

ERNEST S. HEAP, Secretary-Superintendent.

ROYAL DEVON AND EXETER HOSPITAL, Exeter. Applications are invited from registered medical practitioners, Male and Female, for the following appointments :—

RESIDENT SURGICAL OFFICER (B1), now vacant. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £250 p.a. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and rejected by the R.A.M.C., may apply.

HOUSE SURGEON (A) and HOUSE PHYSICIAN (A), now vacant. Salary in each case is at the rate of £160 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointments will be for a period of 6 months. Applicants who may become qualified in October will be considered.

Applications should reach me by Saturday, 14th October.

L. PARKHOUSE, Secretary and Manager.

NOBLE'S ISLE OF MAN HOSPITAL, Douglas, Isle of Man. (137 Beds.) Applications are invited from Male or Female registered medical practitioners for the appointment of SECOND HOUSE SURGEON (A). Salary is at the rate of £175 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months ; otherwise for a period of 12 months.

Applications, with copies of 2 recent testimonials, should reach the undersigned as soon as possible.

Douglas, 26th August, 1944. E. K. KELLY, Secretary.

CITY OF PLYMOUTH. City General Hospital. Applications are invited from duly qualified and registered medical practitioners, Male and Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment of JUNIOR ASSISTANT MEDICAL OFFICER (A) at the City General Hospital. The appointment will be for a period of 6 months, but terminable by 1 month's notice on either side at any time. Salary is at the rate of £250 p.a., plus war bonus, and full residential emoluments. All fees received by the officer must be refunded to the Council. The duties will be mainly in the surgical side of the Hospital. Further details may be obtained from the Medical Superintendent of the Hospital.

Forms of application are not provided. Applications must be addressed to the undersigned, together with copies of not more than 3 recent testimonials, as soon as possible.

T. PEIRSON, Medical Officer of Health.

Seven Trees, Lipson-road, Plymouth.

LINCOLN COUNTY HOSPITAL. (Voluntary Hospital—200 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE PHYSICIAN (A), vacant 1st November, 1944. Salary is at the rate of £225 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when the appointment will be for 6 months.

ARTHUR MOORE, Secretary-Superintendent.

8th September, 1944.

CORNWALL COUNTY COUNCIL. Applications are invited from registered medical practitioners, who are not liable to recruitment or civil direction, for appointment as TEMPORARY ASSISTANT SCHOOL MEDICAL OFFICER. Salary will be at the rate of £500 p.a., rising by annual increments of £25 to a maximum of £700 a year. In fixing the initial salary of the selected candidate consideration may be given to previous experience. A car is essential, and travelling expenses will be paid on the County Scale.

Applications, stating age, qualifications, and experience, with copies of 3 testimonials, should be sent to the County Medical Officer, County Hall, Truro, by the 4th October, 1944.

The Minister of Health has approved this appointment.

L. P. NEW, Clerk of the County Council.

County Hall, Truro, 11th September, 1944.

THE ROYAL HOSPITAL, Wolverhampton. (Incorporated under Royal Charter.) (310 Beds.) Applications are invited from registered medical practitioners for the appointment of RESIDENT REGISTRAR (B1) to the Ear, Nose, and Throat Department, vacant 1st November. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. and D.L.O. Salary up to £400 p.a., according to experience, with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and rejected by the R.A.M.C., may apply.

W. COCKBURN, House Governor.

11th September, 1944.

PRESTON AND COUNTY OF LANCASTER ROYAL INFIRMARY. Applications are invited from registered medical practitioners, including R and W practitioners who now hold A posts, for the appointment of RESIDENT ANÆSTHETIST (B2), vacant 30th September. In the case of R and W practitioners the appointment will be for 6 months. Salary £200–£300 p.a., according to experience, but £350 will be paid to a successful candidate holding the D.A. Full residential allowances.

Applications, stating full particulars, should be addressed to the Superintendent, Royal Infirmary, Preston.

MANSFIELD AND DISTRICT GENERAL HOSPITAL, Notts. (189 Beds and 89 E.M.S. Beds.) Applications are invited from registered medical practitioners for the appointments of HOUSE SURGEON (A) and HOUSE PHYSICIAN (A), both posts now vacant. Salary for each is at the rate of £220 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointments will be for a period of 6 months.

Applications should be sent immediately to—

R. L. WARD, Secretary.

BURY INFIRMARY, Lancs. (159 Beds.) Applications are invited from registered medical practitioners (Male and Female) for the appointment of CASUALTY AND SPECIALS HOUSE SURGEON (A), now vacant. Salary is at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for 6 months ; otherwise renewable.

Applications, giving full particulars, immediately to—

H. WILKINSON, Superintendent.

SWANSEA GENERAL AND EYE HOSPITAL. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £165 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications should be forwarded to—

O. C. HOWELLS, Secretary-Superintendent.

WINTERTON EMERGENCY HOSPITAL. (1060 Beds.) Applications are invited from registered medical practitioners, Male and Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the following appointments, now vacant :—

HOUSE PHYSICIAN (A).
HOUSE SURGEONS (A).
HOUSE SURGEONS (A) to Fracture A Centre and Rehabilitation Unit.

Salaries at the rate of £120 p.a., with full residential emoluments. The appointments will be for a period of 6 months.

Applications should be forwarded to the Surgeon-in-Charge, Winterton Emergency Hospital, Sedgefield, Co. Durham.

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COUNTY BOROUGH OF SOUTHEND-ON-SEA. Education COMMITTEE. CHILD GUIDANCE CLINIC. Applications are invited for appointment as Temporary Part-time PSYCHIATRIST to act as Director of the Child Guidance Clinic. Salary £275 p.a., together with payment of travelling expenses up to a maximum of 25s. per week.

Applicants should submit full details of experience, &c., together with copies of not more than 3 recent testimonials, to the Medical Officer of Health, Municipal Health Centre, Warrior-square, Southend-on-Sea, from whom full particulars may be obtained. Last day for receiving applications 2nd October. H. BOYES WATSON, Chief Education Officer.

Education Office, Warrior-square, Southend-on-Sea,
4th September, 1944.

DERBYSHIRE ROYAL INFIRMARY, Derby. (Voluntary Hospital —Total Beds 416, plus 230 E.M.S.) Applications are invited from registered medical practitioners (Male and Female) for the appointment of CASUALTY OFFICER (A), vacant 1st October. Salary is at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of 6 months.

Applications should be sent to—
ARTHUR TAYLOR, Superintendent and Secretary.

SUSSEX EYE HOSPITAL, Eastern-road, Brighton, 7. (48 Beds.) Applications are invited from registered medical practitioners (Male or Female) for the appointment of HOUSE SURGEON (B2), duties to commence as soon as possible. Salary is at the rate of £175 p.a., with full residential emoluments. R and W practitioners holding A posts may also apply, when appointment will be limited to 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be sent to: PERCY F. SPOONER, Secretary-Superintendent.

VICTORIA HOSPITAL, Accrington. Applications are invited from medical practitioners (Male) for the appointment of HOUSE SURGEON (B2). The salary is at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Apply, with copies of 2 testimonials, to Hon. Secretary.

CAMBORNE-REDRUTH MINERS' AND GENERAL HOSPITAL, REDRUTH, CORNWALL. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). Salary at the rate of £200 p.a., with the usual residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, together with copies of 3 testimonials, to be addressed to: J. C. FIELD, Secretary-Superintendent.

Redruth, September, 1944.

WESTON-SUPER-MARE GENERAL HOSPITAL. (100 Beds.) Applications are invited from medical practitioners (Male and Female) for the appointment of HOUSE SURGEON (A), duties to commence immediately. Salary is at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when appointment will be for 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be addressed to: LESLIE J. FURSLAND, Secretary.

CITY OF PORTSMOUTH. Saint Mary's Hospital. (1200 Beds.) Applications are invited from Male registered practitioners for the appointment of JUNIOR RESIDENT MEDICAL OFFICER (A). The salary is at the rate of £250 p.a., with residential emoluments valued at £150 p.a., and a temporary cost-of-living bonus at present payable at the rate of 9s. 6d. per week. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months; otherwise for a period of 12 months.

Application forms may be obtained from, and must be returned to, the Medical Officer of Health, Northern Secondary School, Mayfield-road, Portsmouth. FREDERICK SPARKS,
Municipal Offices, Royal Beach Hotel, Town Clerk.
Southsea, 11th September, 1944.

EAST SUFFOLK AND IPSWICH HOSPITAL. (400 Beds—7 Residents.) Applications are invited from registered medical practitioners, including R practitioners who now hold A posts, for the immediate appointment of HOUSE SURGEON (B2) to the Senior Surgeon. Appointment will be for 6 months. Salary is at the rate of £175 p.a., with full residential emoluments.

ARTHUR GRIFFITHS, Secretary.

The Hospital, Ipswich, 2nd September, 1944.

ROYAL SOUTH HANTS AND SOUTHAMPTON HOSPITAL. (255 Beds.) Applications are invited from registered medical practitioners, Male and Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment of CASUALTY OFFICER (A). The appointment will be for a period of 6 months. Salary is at the rate of £175 p.a., with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent immediately to—
EDWARD L. WIRGMAN, House Governor and Secretary.

BECKENHAM HOSPITAL, Beckenham, Kent. Applications are invited from registered medical practitioners for the appointment of RESIDENT MEDICAL OFFICER (B2), vacant 1st October. Salary is at the rate of £150 p.a., with full residential emoluments. R or W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise will be renewable for a further period of 6 months.

Applications, accompanied by copies of recent testimonials, and with full details of experience and qualifications, should be addressed to: GORDON EASTO, Secretary.

WALSALL GENERAL HOSPITAL. (181 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of CASUALTY OFFICER AND ORTHOPÆDIC HOUSE SURGEON (B2). Salary is at the rate of £200 a year, with full residential emoluments. R and W practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be forwarded immediately to—
22nd August, 1944. N. M. AULT, Acting Secretary.

WREXHAM AND EAST DENBIGHSHIRE WAR MEMORIAL HOSPITAL, WREXHAM. Applications are invited from registered medical practitioners, Male and Female, for the following 6 months' appointments:—

2 RESIDENT HOUSE SURGEONS (A), to commence immediately. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

Applications, stating age, nationality, qualifications, and accompanied by copies of testimonials, to—
LESLIE SPENCER, Secretary.

BECKETT HOSPITAL AND DISPENSARY, Barnsley. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (B2), vacant immediately. The salary is at the rate of £225 p.a., with full residential emoluments. R and W practitioners holding A posts may also apply, when appointment will be limited to 6 months.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent forthwith to—
ARTHUR L. BOURNE, Secretary-Superintendent.

ST. NICHOLAS' ORTHOPÆDIC HOSPITAL, Pyrford, near WOKING. Applications are invited from registered medical practitioners (Male and Female) for the appointment of HOUSE SURGEON (B2). Salary £200 p.a., resident. (The Hospital has 285 Beds, including E.M.S., is an Orthopædic Centre and a Peripheral Nerve Centre; additionally there is a continuous course of instruction for undergraduate students of St. Thomas's Hospital.) The period of appointment is for 6 months. R and W practitioners holding A posts may apply.

Apply immediately to the Secretary.

COUNTY MENTAL HOSPITAL, Dorchester, Dorset. Locum TENENS ASSISTANT MEDICAL OFFICER required. Salary 10 guineas weekly, plus residential emoluments.

Apply to the Medical Superintendent.

Works' Doctor required for a large factory in the London area employing several thousands. It is essential that applicant should have had the requisite experience as a Medical Officer in industry. Age between 40–50. Salary, according to industrial experience, from £800 to £1000.—Apply, giving full particulars, to: Address, No. 482, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Wanted immediately, Assistant in Town and Country Practice in Hertfordshire.—For further particulars apply to: No. 464, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Doctors, Male and Female, required for Locums and Assistantships. Vacancies for Hospital Locums and Ships' Surgeons. Practices and Partnerships for disposal.—Write: A. SHAW, Medical Transfer Agent, Premier Buildings, 88, Church-street, Liverpool.

Service Medical Officer, English, Regular, seeks appointment in Post-War Medical Relief Organisation. Age 33. 7½ years' service. Fluent German, good French. Excellent administrative and clinical references.—Address, No. 481, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Nurse-Receptionist seeks Post with Doctor; also clerical experi- ence. Excellent references.—Address, No. 483, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

North London. House in secluded grounds of 1 acre and facing woods. Ideal for exclusive Nursing Home. 8 Bedrooms, Lounge Hall, 3 large Reception Rooms, usual offices. £5250, with vacant possession.—Further particulars from: NEWMAN, 12, Turnpike-lane, N.8. Telephone: BOWes Park 2433.

For Sale immediately, good Country Practice in Warwickshire. Panel 750. Excellent house and garden.—Address, No. 485, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2

Varityper Typewriter, portable, as new, 4 different faces, case and accessories.—Address, No. 484, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Books and Libraries Purchased.—Galloway & Porter, Ltd., University Booksellers, Cambridge.

Medical Photographs and Drawings for illustrations, records, &c. —Write for particulars: E. O. SONNTAG, 159, Bickenhall Mansions, Baker-street, W.1. WELbeck 8860.

Microscopes wanted for essential work and war factories; high prices offered. Also Leicas and similar Cameras and "Talkies." Prompt cash.—WALLACE HEATON LTD., 127, New Bond-street, W.1.

Psychological supervision during convalescence. A maximum of 6 patients can be accommodated in physician's home with 10 acres of ground extending to Thames bank. 10 guineas weekly. —Apply Secretary, Weir Cottage, Chertsey. Tel. 2135.

Radium: You can hire up to 100 mgms. of radium element made up to any required specification, for the moderate fee of £5 5s., from: J. C. GILBERT, LTD., Columbia House, Aldwych, W.C.2. Tel.: Chancery 6060.

THE NATIONAL MEDICAL AGENCY.

Practice wanted, London, with scope (Bachelor).

Full details from THE NATIONAL MEDICAL AGENCY, 63, Great George-street, Leeds, 1.

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When the severity of the condition demands rapid absorption of sulphanilamide, or when oral administration is impracticable or difficult, 'Hypoloid' brand Sulphanilamide L.S.F. enables full doses to be given by intramuscular, subcutaneous or intravenous injection. In addition to its high sulphanilamide content (15%, or 3 gm. in 20 c.c.), 'Hypoloid' brand Sulphanilamide L.S.F. has the important advantage of being nearly neutral in reaction. It is thus non-irritating to the tissues, causes no pain at the site of injection, and has no tendency to produce local necrosis.

'HYPOLOID' BRAND **SULPHANILAMIDE L.S.F.**

sulphanilamide in combination as sulphanilamide lactoside sodium formaldehydesulphoxylate

Ampoules of 5 c.c., in boxes of 6, and rubber-capped bottles of 25 c.c., 50 c.c. and 100 c.c.

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